

# Good Bye Spreader Bars (and plug for the new D4 Portaledge)

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**deuce4**  
climber  
Hobart, Australia

Topic Author's Original Post - Feb 14, 2017 - 07:04pm PT

Hello all-

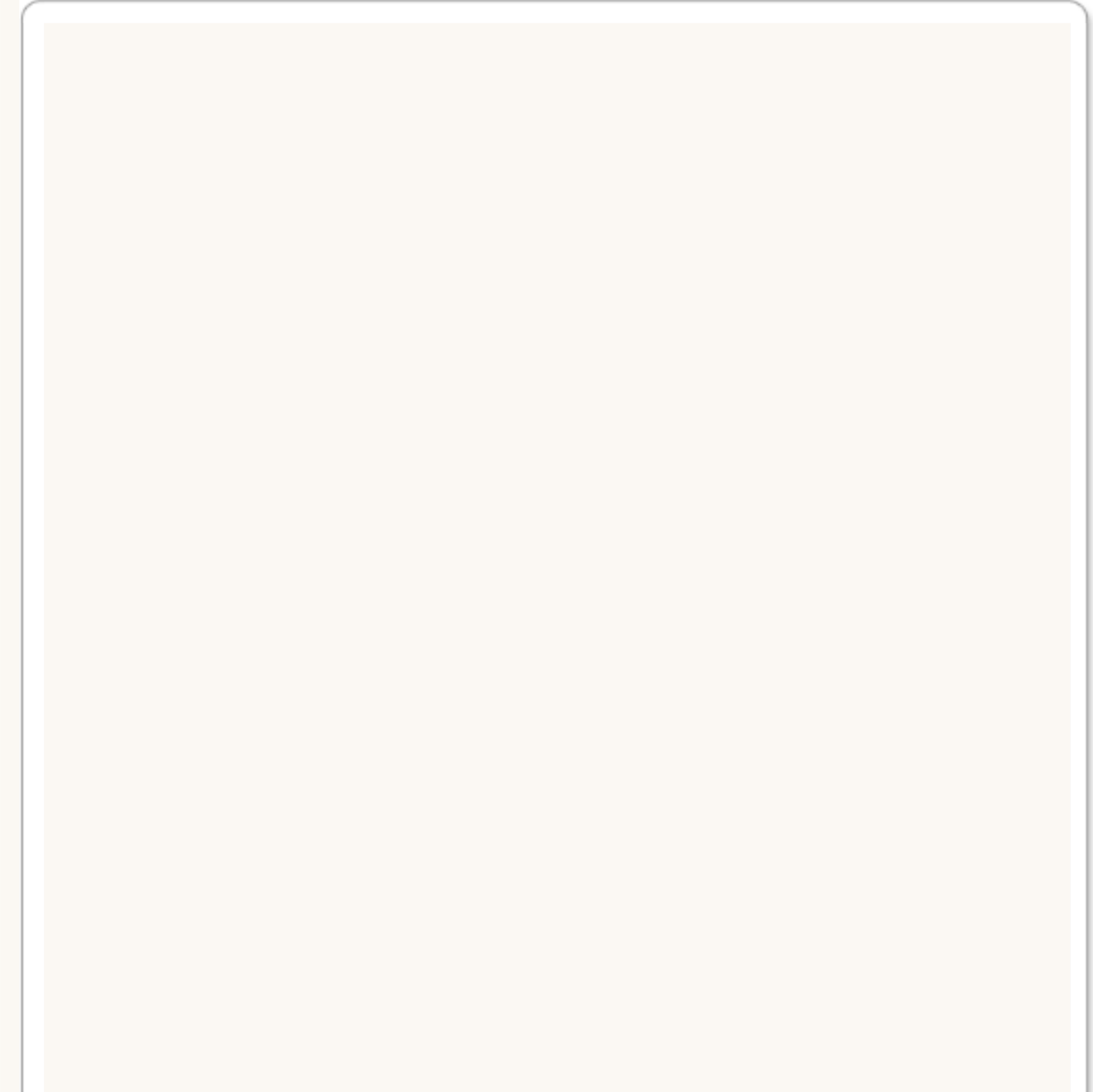
I am about to share details on new portaledge design (the D4 Portaledge) via a crowd funder, and felt it was most appropriate to reveal one of the new features here on Supertopo first, as Supertopo has always been lively with interesting thinking! My new D4 ledge has four major innovations, and I am quite confident the design will become the new paradigm of portaledges in the years to come, as it is stronger, lighter (around 6kg with haulsack and fly), more rigid, easier-to-deploy and pack up, and packs smaller. These are all things I believe are essential for remote lightweight alpine big walls, as well as making an El Cap ascent more fun.

First, a bit of history. In 1986 I started designing portaledges after getting rescued on Half Dome with the then state-of-the-art portaledge design, the frames collapsed and the flies shredded in the wind, and we almost died of exposure. I moved to Arizona (warmer climes!), and after a bit of engineering analysis, decided to use 1 1/8" 6061-T6 tubing with 0.058" wall thickness for my new design. All other portaledges--mostly homemade ones back then, along with the Gramicci and Fish--used 1" tubing or smaller. Part of the reason I chose the 1 1/8" 6061-T6 aluminium (1.125" Outside Diameter, 0.058" Wall thickness) is I was also getting into hang-gliding at the time, and while learning to fly, bent a few triangle control frames on bad landings and had to replace them. The 1 1/8" 0.058" wall 6061-T6 aluminium tube is the exact same stuff used for the hang-gliding down tubes, so I had a supply.

Next, using my engineering skills learned in Uni, I completed a iterative analysis to determine (for a given assumed load of two people in a worst case loading situation) what the largest rectangular frame that could be built with 1.125"OD 0.058"Wall tubing. This resulted in what is now known as the "A5 Alpine Double", which was 43" wide by 75" long (this is the exact model made by Runout Customs today). The A5 Double was the first commercially available two-person portaledge (note: Gramicci had made some double ledges a few years before, but only a very few were made and they were never offered publicly for sale). We made the first prototype for Mugs Stump (who coined the term 'Shark Fins') and after he came back from a climb in Alaska with it, we began full scale production (interesting note--we had actually made a three-person ledge before we ever made a two-person one, a custom ledge for Mike Hoover for an Antarctic trip).

The first A5 double ledges had a lot of new features which evolved over the years and have become the standard for modern portaledges, such as the angled Shark Fin dividers, the bed tensioners, the block corners, cam-buckle suspension, the single-seam fly, and a bunch of other stuff you see on most ledges today.

(more soon)--In the meantime, if you'd like updates on the new D4 ledge, like and follow the Big Wall Gear Page on Facebook: <http://www.facebook.com/bigwallgear/>



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SuperTopo on the Web



D4 Prototype #1

Credit: deuce4

Sign up here to get updates for the upcoming D4 Portaledge Kickstarter:  
<http://eepurl.com/cDn3kT>



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Feb 14, 2017 - 07:42pm PT

John might use big words like "asbestos" and "marmalade", but his D4 ledge is a whole new paradigm in ledge design.

You guys won't believe it .... It's THAT good!

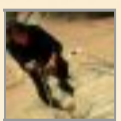


**OlympicMtnBoy**

climber  
Seattle

Feb 14, 2017 - 07:46pm PT

Can't wait to see it, I still have two Gramicci ledges that someone gave me for a free many years ago. The original fly makes it hard to sleep with the stench and you worry about it collapsing with a strong wind gust. I should probably upgrade . . .



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 14, 2017 - 07:58pm PT

Around 1993, three-person big wall teams in the remote ranges were coming in vogue, so I designed the Cliff Cabana, which originally only came with the Diamond Fly, and was first used on the first ascent of Escudo (more info here: <http://www.bigwalls.net/climb/Escudo.html> ). Now, in terms of frame, of course it had to be significantly stronger for three people, but we also had a lot of infrastructure in the 1 1/8" block corners, so I still used the 1.125" OD tubing but simply beefed up the thickness to 0.083", and that seemed adequate for the limited market of this specialised, three person ledge (very large top platform--51" wide and 86" long--so three people can sit and cook, but a place for the third person to sleep in the hammock below--the fly also can be anchored from below and is streamlined for the intense updrafts that are experienced on the big stones).

The 1990's saw a huge boom in standards in remote big wall climbs, nearly every expedition to the Karakoram, Himalaya, Patagonia, Baffin Island, Central Asia, Africa, and many other places where big faces were getting climbed for the first time were using the A5 ledges, mostly the A5 Alpine Double size. We made both a regular drape-over fly and also developed the expedition fly which was completely enclosed and had a floor and two doors--the expedition fly was for those specialised situations where every BTU was essential for survival. On Great Trango in 1992, we spent three nights battling a severe storm at 19,500' with the original drape-over type fly on an Alpine Double ledge, and we survived, but I would have liked to have something a bit more secure, especially in those severe winds, thus the impetus for the expedition stormfly design.

You can check out the 1996 A5 designs here: <http://www.bigwalls.net/new2016/1996Catalog.pdf>





always liked this photo by Eric Brand--Jared O. in one of the first A5 Expedition Stormflies on the first ascent of the North Face of Nameless in 1995--the biggest baddest full north-facing Karakoram big wall!

Credit: Eric Brand

to be continued...



ms55401

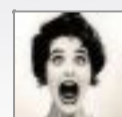
Trad climber  
minneapolis, mn

Feb 14, 2017 - 08:02pm PT

*Supertopo has always been lively with interesting thinking!*

uh, no and, emphatically, no

that said, I'm keenly interested in this D4



Moof

Big Wall climber  
Orygun

Feb 14, 2017 - 08:22pm PT

Can't wait! I'll need one, since you know that 5 ledges is not enough for one fellow...



ontheedgeandscaredtodeath

Social climber  
SLO, Ca

Feb 14, 2017 - 08:55pm PT

Looking forward to seeing the new ledge design. I remember all those 90s A5 innovations from when I lived in Flagstaff. I really have never been much of a wall climber but I still have one of those A5 visors from that era. I think Tim or Barry made it for me.

I think Doug and I used one of the early fully enclosed flies in a storm on Mescalito:



Credit: ontheedgeandscaredtodeath



BLUEBLOCR

Social climber  
joshua tree

Feb 14, 2017 - 09:17pm PT

^^^ you mean one of these?

Yeah Duece! I'm in the market for a ledge now to.. Hope they're inexpensive.



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 14, 2017 - 09:27pm PT

In 1998 I sold my company and worked in California long hours (mostly very early mornings to mid-afternoons, as a morning person) for 18 months to ensure the production of the ledges within a larger corporation (this was a challenge), as well as developing a number of new products, including a new breathable fly material using PTFE (performed better and was 1/3 the price of the major brand), and the first completely waterproof backpacks and haulbags with welded seams. Then I moved back to Flagstaff to become a Grand Canyon River guide and to pursue other interests in architecture and tension fabric design. River guiding is dreamy, and I got a bit out of shape going with gravity instead of against it (plus the food on commercial trips is amazing).

I digress. Sometime in the early 2000's, BD acquired my portaledge designs but astoundingly (to me) dropped the proven and useful Alpine Double size. They also changed the way the Cliff Cabana folds from a 10-piece frame which enabled it to pack up to a reasonably size--around 30" x 8"--to a 6-piece frame, which packs very long!. I couldn't believe it when I first saw someone walking out of the El Cap woods with the new version of the Cliff Cabana--packed up, it was massive, almost as tall as the climber carrying it! I don't see how anyone is going to be carrying that kind of thing up a dangerous alpine approach like you get on the remote big walls. Also, somehow they have added over 9 pounds to the design (the A5 Cliff Cabana was 19.5 pounds with storm fly, the BD is over 28.5 pounds--compare these weights with the A5 Alpine Double with regular fly weighing in at 12.5 pounds!)

Another development of course was the Metolius ledge (45" x 84", 20.5 lbs with haulsack and fly), which again was modelled after the A5 Alpine Double (during a climbing trip to Smith Rock, Tim Maloney, who worked at A5 in those days, reported seeing a dismantled A5 ledge in their shop a year or so before their ledge came out). It has the same major features: block corners, shark fins, single seam fly, bed tensioners,etc.) They did come up with one nice innovation, though, the top metal clip-in point, which, though adding weight, lessens the need to manually seam seal the top clip-in, and probably provides long-term assurance of the strength of the clip point.

More on those designs next post, as it relates to the innovations forthcoming...



BLUEBLOCR

Social climber  
joshua tree

Feb 14, 2017 - 09:55pm PT

Yeah remember when I made that first ledge with a spreader bar in your shop, it was right after you made that diamond fly for Brad? Everyone at -A5 loved it, but you were already to make the move to NF. Welp in the next year or two I took the idea to Metolious. Along with my model of the Accentrier, now they call it the EasyAider. Anyway Jim Karn was there at Metolious with the idea of the metal anchor point. And they were all psyched to put out a new bomber ledge. I showed mine and they loved it. That was all fine and dandy but my interest was in my adjustable aider. Well Over the next couple months Doug machined me a few test pieces to test out. One of them was very good, I just wanted him to add a gate like a Hotwire gate. Story goes I moved on and never heard more from them. Next thing I know the "Bombproof" ledge, and the "EasyAider" come out. Cool! I've never seen squat for my input or ideas. I used to think those guys at Metolious were Bro's. They're not, just business men! Like Trump. Lol



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 14, 2017 - 10:00pm PT

more tomorrow!

Feb 15, 2017 - 02:30am PT





ecdh

climber  
the east

Simply yes, yes and yes.

Theres an unfinished project and this could be one of the keys. Bring it on.



couchmaster

climber

Feb 15, 2017 - 05:18am PT

Lighter than a Fish Double? Nice, congrats and good on you for getting at it again John. You always made top shelf stuff, looking forward to this and more.



mikeyschaefer

climber  
Sport-o-land

Feb 15, 2017 - 09:36am PT

I've been wondering when ledges would get a real update. I feel most ledges in the last 10 years have almost been a downgrade. I have a hard time using the BD option just because it is so heavy! Took two of those things down to Venezuela a few years back and was ready to just leave them there after the trip!

I still miss the original A5 double with expedition fly. Pretty much perfect for 90% of all big walls.



WBraun

climber

Feb 15, 2017 - 09:45am PT

John Middendorf showed me his new portaledge prototype and did some last needed modifications when he was here in Yosemite last fall.

He was really excited and I hope it becomes a successful product especially on the weight side of it.

Biggest drawbacks to the ledges are weight and ease of setup especially the bed when a big storm is on top of you.

Good luck John and was so great to see you again.

You're still wild as ever ..... :-)



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 15, 2017 - 10:35am PT

It was more than just "modifications", Werner! That time working with you last fall in your workspace is one of my funnest and proudest moments of creative hacking ever (not to mention getting to hang with you and Merry after so many years--my first visit to Yosemite this century!). I came to the Valley with nothing but a frame of my new design--I hadn't been able to get the bed and fly done in time for the trip. Somehow I procured a broken abandoned portaledge, and one of my old flies from 1990 that had been in the Zion museum for many years, and some other bits of straps and webbing from various climbers in El Cap Meadow, the new nearly full time hang for all the cool climbers (thanks, Tom Evans!).

The bed didn't fit my frame, so bustling around the valley with you to borrow tools like a decent tube cutter from all the Yosemite infrastructure sheds was an adventure in itself! That sewing machine the horse packers use is a classic! After three of four days, though, the first very rough prototype ledge was coming together. At that point I really had no idea if my design was going to work, but once a had a proto, I could see that all my hard work designing various structural dimensions and concepts, that this new design was really going to be a breakthrough.



Werner's Shop

Credit: deuce4

I was hoping to test it on El Cap, but I didn't really have all the gear for a wall (guys like Robbie and even Alex Honnold in the meadow one day offered to lend me any gear I needed!), but I was mostly nervous about going up in late October with that old fly of mine--over 25 years old--and I suppose I was hesitant to depend on a ledge fly I hadn't made myself (but more likely was just experiencing pre-wall jitters, haven't climbed a wall in 15 years, and want to be more prepared when I do--perhaps this year!).

But I did test my new design at the base of Sheep Ranch, hanging from the first A3 move (plus a rivet) where I bivied one night, and realized I was on to something.

But more on the main structural story (and why spreader bars are a thing of the past) soon...



**the Fet**

climber  
Tu-Tok-A-Nu-La

Feb 15, 2017 - 11:27am PT

Future SuperTopo climbing news email entry for sure!



**Moof**

Big Wall climber  
Orygun

Feb 15, 2017 - 01:19pm PT

The teasing is killing me. Cruel. Looking forward to ordering one.



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Feb 15, 2017 - 03:28pm PT

I know the start of the Ranch well. In 2004 on Day One I busted my ankle when I hit the ledge falling off. Bimollular fracture. Free plates and screws. In Canada.



**Mike.**

climber

Feb 15, 2017 - 06:16pm PT

Thanks for updating us on your exciting project, Midds. Best wishes for success.

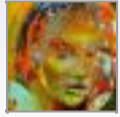


**anita514**

Gym climber  
Great White North

Feb 15, 2017 - 06:30pm PT

Will it be available in hot pink?



**healyje**

Trad climber  
Portland, Oregon

Feb 15, 2017 - 06:32pm PT

..and with a 'pussy fly'? Want to be able to make a statement with it if it's going to hanging out there for everyone to see.



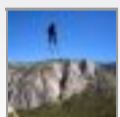
**couchmaster**

climber

Feb 16, 2017 - 09:39am PT

Have this fella do the product set up video, the man clearly has skill for it. Look how ridiculously easy he makes this one appear. It's enough to make ya hate him for how easy it should be. Like a Carney with the skillz to take yer money cause he can whack the balls every time and you can never do it. Spoiler alert, the 1st 30 seconds are music.

[\[Click to View YouTube Video\]](#)



**matty**

Trad climber  
under the sea

Feb 16, 2017 - 10:28am PT

^^^ way easier standing on ground with unused ledge resting on table



**Mungeclimber**

Trad climber  
Nothing creative to say

Feb 16, 2017 - 10:45am PT

My ratio of 1:3 times getting my Fish ledge to fold up easily is getting better. Lack of time on wall is a clear factor this year.

Deuce, it wouldn't be right if you hadn't have spent time in the Valley working on it. Great story/stories! Keep em coming!

This is a proper Supertopo thread.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 16, 2017 - 11:17am PT

Sorry, was called off yesterday to do some payback for my paragliding pilot friends--did a all-day retrieval for two local pilots going for the Tassie distance records. One of them was brought down by Wedge Tail Eagle attacks, the other made only 40 km or so--big challenge because legal airspace is very low in the midlands where the land passes are also high, so narrow gap to break through for bigger distances.

The next part of the story needs to include some technical engineering info, so i have been pondering how to explain clearly. I made this video last year in response to the Aluminum/steel 'debate' to help explain how flex/rigidity compares with tube geometry as well as material aspects, It doesn't cover the 'why' so I will work on a simpler explanation, as it plays into how spreader bars are unnecessary and really a design 'kludge' based on lack of proper engineering design.





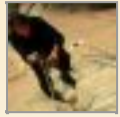
Plaidman

Trad climber  
West Slope of Powell  
Butte, Portland,  
Oregon, USA

Feb 16, 2017 - 03:55pm PT

Thx John for posting the history and the path of development of your new Portaledge.

Plaid



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 16, 2017 - 04:07pm PT

No worries, Plaid. It was nice meeting you last fall, have enjoyed reading of your adventures as well!

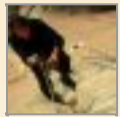


Gunkie

Trad climber  
Valles Marineris

Feb 16, 2017 - 04:54pm PT

I'm sure many frame variations have been analyzed, but to keep weight down, has double butted tubing ever been considered? How about triangular cross section tubing? At some point various costs (time, money, opportunity) outweigh performance benefits. Just curious.



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 16, 2017 - 07:33pm PT

Love all the ideas popping up. As I posted on the Wired Bliss thread somewhere in here, I think there's some potential for better online group collaboration sites, to enhance idea sharing--still experimenting with sites like this one: <https://500px.com/JohnDeuceyMiddendorf/galleries/monkey-paw> Sketches and visuals are essential in my opinion to share ideas properly, so they can be more clearly discussed and refined.

Back to the main story:

So here's the rub: One thing Metolius did was to respond to folks wanting a more comfortable big wall camping experience (I suppose I could say in the 90's survival was more the overarching parameter!), and so they made their ledge bigger than the then best-selling A5 Alpine Double, to 45" wide and 84" long. Of course, making it bigger affects the engineering, but they did so without redesigning the frame--they simply used the same 1.125"OD 0.058" 6061-T6 Aluminum tubing of the A5 Alpine Double, which size, as mentioned before, was optimised for that tubing to be 43" by 75".

Guess what? No surprises here, frame flex became an issue. If you think about a simply supported beam (which is what a portaledge tube really is), if you extend the distance from the support to the load, an 'elastic' beam will flex more (in engineering terms, materials are elastic until they permanently deform, then they are plastic!). In fact, the relationship of load to bending is dependent on the third power of the distance between support and load. Here's a simple case with the mathematic formula:

**Examples of deflection formulae**

- Cantilever beam loaded at free end**

- $\delta_{max} = \frac{P L^3}{3 E I}$  (at free end)

Deflection  $\delta$  (flex) is dependent on the third power of the length L.

Credit: Google

So for the long tubes, we can use that formula (I'll explain the other variables later) to get a rough idea of the relative additional flex an 84" air side tube will have over a 75" air side portaledge tube by finding the ratio of 84 to the third power divided by 75 to the third power, which turns out to be 1.4.

What this means is that for a given load and beam configuration, an 84" long air-side tube will flex 40% more than a 75" long air-side tube.

(ok, it is more complicated than how I am describing it, as the beam in question has a distributed load supported on both ends which is a slightly different formula, etc, but the analysis gives a good general idea of what is happening--the "third-power" relationship of deflection to length in beam loading is the key here).

To make matters worse, they came up with what I consider a whacky open corner concept to ease assembly. Now, I came up with the portaledge block corner design back in 1986 (now seen on all BD, Metolius, and Runout ledges) to ensure a rigid corner connection. Rigid corners were the first big breakthrough in portaledges--starting with the Fieldware/Fish single ledge in 1985--ledges before that time all had soft or hinged corners which frankly only work when the ledge is set up on a nice flat wall--put the ledge in a corner or some other bad loading situation, and a ledge



without rigid corners turns into a trapezoid. Rigid corners are essential for a good sturdy ledge.

Below are some pictures of open corners--I think it is easy to see that the whole frame becomes less rigid and flexes more with an open corner.



from <http://www.supertopo.com/climbers-forum/2381104/UNUSED-BD-Cliff-Cabana-Double-Ledge-For-Sale-FOR-A-STEAL>

Credit: deuce4

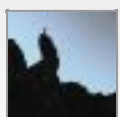


open corners add flex to system.

Credit: deuce4

So with a more flexy ledge, Metolius re-introduced the spreader bar.

(not finished with this part, but gotta go pick up boy from school--tell me if I am getting too technical). Also want to discuss a super simple way to ease assembly without having to resort to open corners.



**nathanael**

climber  
CA

Feb 16, 2017 - 08:23pm PT

Not too technical! Thanks for sharing, reading with great interest and awaiting more updates.

Topic Author's Reply - Feb 16, 2017 - 09:24pm PT





deuce4

climber  
Hobart, Australia

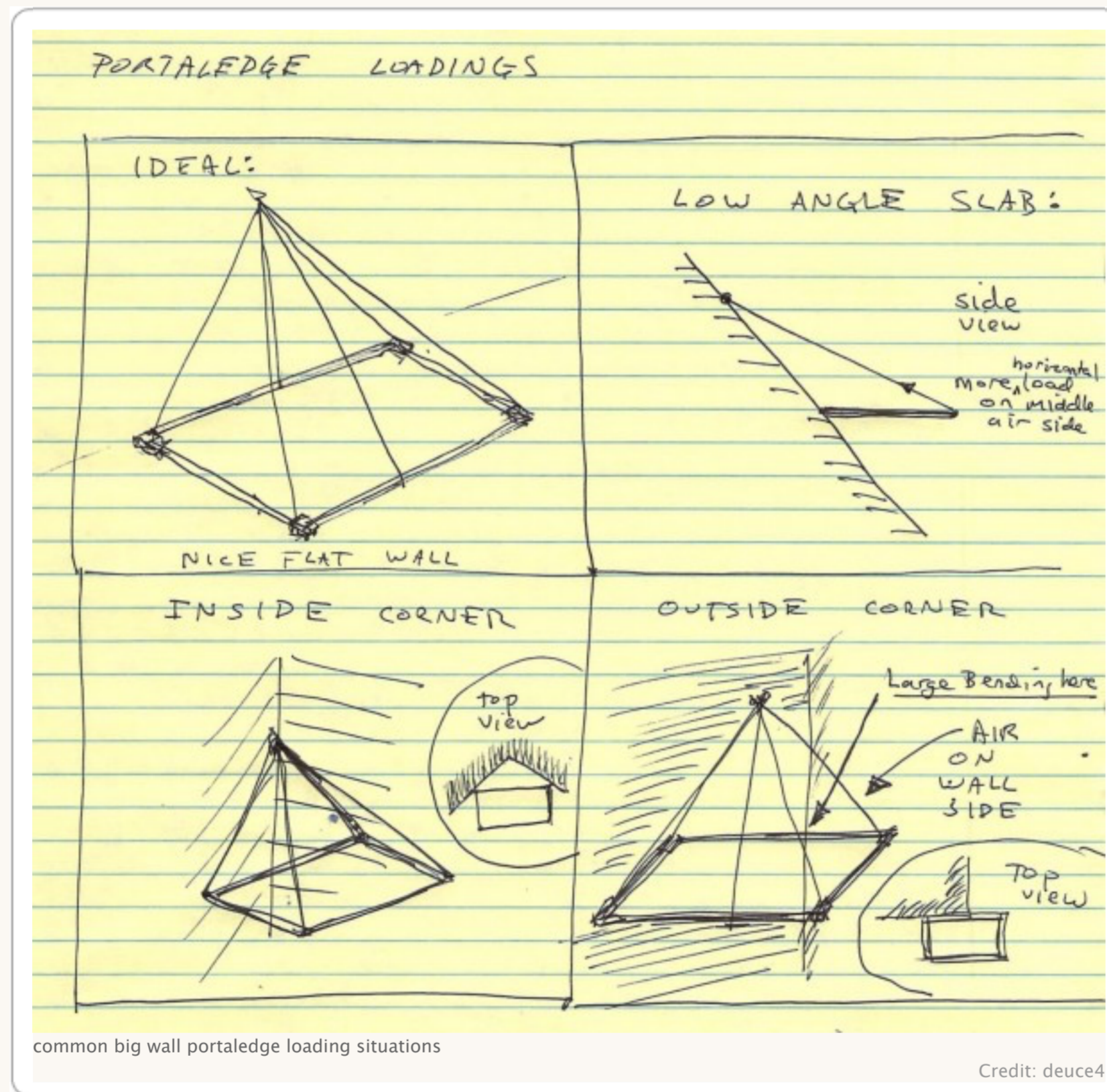
Ok, back.

Metolius did not invent the spreader bar. Charlie Row had built a homemade single portaledge out of 7/8" thin wall tubing back in the 70's, and because the tubing was under designed, which he knew, he added a spreader bar to keep the ledge open in the middle.

Now, I have never used a ledge with a spreader bar, but I hear that they can be hard to set up, have to be placed fully square or they spontaneously spring loose (good review here: [http://www.fishproducts.com/miscpages/portaledge\\_review.pdf](http://www.fishproducts.com/miscpages/portaledge_review.pdf)), and that they can dig into your back when you're sleeping (PTPPete told me that)--doesn't sound like fun.

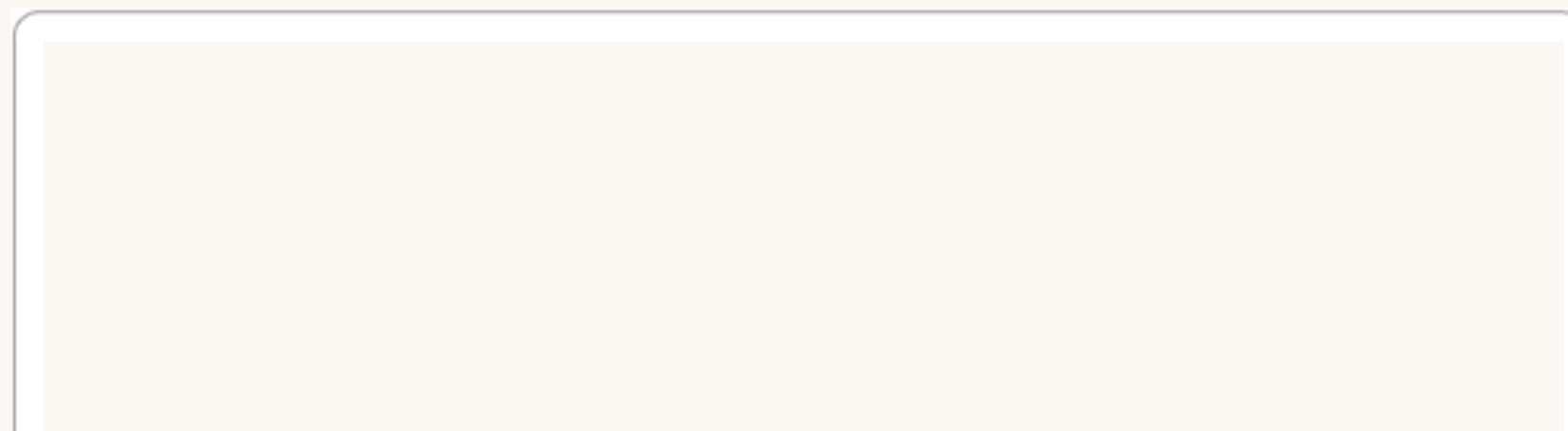
What we are after here is rigidity, less flex, or, in engineering terms, less deflection for a given load. People often think "strength" when talking about portaledge tubing. Of course strength is important, but almost more important is rigidity. Similar to the reasons why steel frames flex more than aluminium for a given weight as shown by FEA in the video above, so does titanium. We had a titanium ledge on Great Trango--the first of its kind--and though a pound or so lighter, and stronger too (in terms of its ultimate failure strength), but because of its smaller diameter (7/8") and thinner wall (0.028"), it flexed more than the equivalent weight aluminium frame. Titanium was ideal, however, for the 3kg super light custom single ledge I made for Catherine Destivelle for her historic solo first ascent on the Dru (pictures at the end of this article: <http://www.bigwalls.net/climb/mechadv/index.html>). Her ledge, with fly, packed into a tiny (for a portaledge) 24" x 4" bag, so a main advantage of the titanium for her ledge was its smaller packed size, as the tubes were less than 7/8" O.D., and the flex wasn't as big an issue because I made a super small custom ledge and lightweight fly for her (from memory, I think 72" x 25").

More on titanium: In the 90's the Soviet Union was collapsing, and the market was flooded with cheap titanium, presumably raided from once government and military stocks. I had a line on the stuff from a Russian climber, and once made a super heavy 1" (maybe 3mm wall thickness) titanium portaledge. It was adequately rigid and unbelievably strong--I think we once got 10 guys jumping on it without failure--but way too heavy for taking up a wall. It was the perfect car-camping portaledge, though, and spent many happy nights, often with girlfriends with whom I was exploring the southwest, while hanging from a nearby tree for the night.



But besides that one-off and way overdesigned titanium ledge, even the next-strongest A5 ledge back in the day (and we made a lot of variations of one-, two-, three-, and even four-person portaledges) did not do well when tied to a tree-- a lot of flex--the point load from a tree is one of the worst case loading situations, one that would rarely be found in real-world big wall applications. And I doubt that the BDs and Metolius, with under-designed tubing for its size, even with the kludge spreader bar, do well in terms of flex when set up in a tree (it seems to me that the point load would compromise the integrity of the spreader bar causing it to pop out if put against a tree?).

But my new D4 design does incredibly well when set up in a tree--I recently had about 7 people in it (ok, some were kids) with almost no flex, and no spreader bar. How? For this I need to introduce another engineering concept--the Second Moment of Area, aka Area Moment of Inertia (not to be confused with the Mass Moment of Inertia), or we can use the Elastic Section Modulus. These are properties based purely on the geometry of the tubing, and can help us figure out relative strengths and flex of tubing under load.







Seven people at one point were in this D4 ledge (2 adults and 5 kids), with very little flex of the tubes around the tree!

Credit: deuce4

More tomorrow on Section Modulus and the secrets of eliminating the spreader bar (y'all can probably guess where I am heading, now ;)



Moof

Big Wall climber  
Orygun

Feb 17, 2017 - 08:35am PT

Trouble I have had with my home made projects is that to keep bed sag low enough side to side it is necessary to make the bed tight, resulting in difficult assembly. Really small window to hit while winging it on a home project. Spreader bar helps with all that, but then you have to use a stupid spreader bar. Looking forward to the details.



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 18, 2017 - 01:25am PT

Ok, after thinking a bit, I will try to explain this using the Section Modulus, as I would like to include a discussion of both strength and flex. (Note: Engineers think a bit differently, strength is thought of in terms of stress, and flex (deflection) is never simply called flex, of course ;)

Strength uses the Section Modulus (we'll call it 'S'), and flex uses the Second Moment of Area/Inertia (I). Again, these are purely based on the geometry, and they are related by the outside diameter (OD) of the tubing, where  $I = S * OD / 2$ .

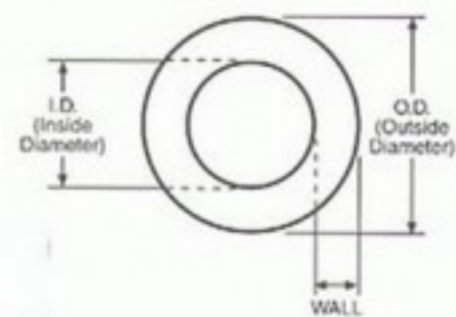
Never mind that. Think about a piece of 2x4 wood--if you were building a cantilever, which way would you put the wood? It would be stronger and less flexy if you put the wood upright, or course, rather than on its side. That's what the section modulus formula is all about--the more material away from the center in the direction of load, the better, for both strength and flex.

Here's the formula for Section Modulus of a tube (again, note how it only relates to geometry, not actual material properties).

## Section modulus

The Section modulus, S, for a circular tube with Outer Diameter, O.D., and Inner Diameter, I.D., is:

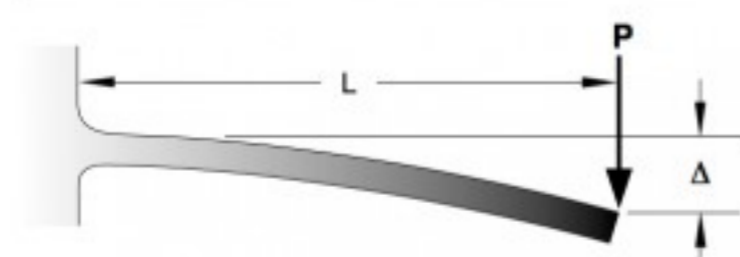
$$S_{\text{circular tube}} = \frac{\pi * (O.D.^4 - I.D.^4)}{32 * O.D.}$$



Section Modulus--the fourth power relationship to Outside Diameter (OD) is what's significant here.

Credit: deuce4

When you are designing the best tubing for a portaledge, there's a lot of engineering things to think about: bending, deflection, buckling (a problem if you make the tubes too thin), size and weight, to name a few. We'll focus on the comparative aspects of strength and flex here.



Cantilever Beam, End Load

$$\sigma = \frac{PL}{Z} \quad \Delta = \frac{PL^3}{3EI}$$

Stress and deflection formulas.

Credit: deuce4

For strength, we can simply create a "Strength Index" =  $S * Y$ , where Y equals the Yield strength. Bigger numbers are better.



For flex, we use the formula above to create an "Flex Index" =  $(L^3/L)/(E*S*OD)$ , where E is the Elastic Modulus (Young's), S is the Section Modulus, and OD is the outside diameter. Smaller numbers are better. Note that actual material properties are now coming into play.

I use this site for my material data: <http://www.matweb.com/search/PropertySearch.aspx>

Here's a table of some properties we will use for the next part:

Material Properties			
Material	Y Yield Strength (KSI)	E Modulus of Elasticity (KSI)	Density (lbs/in <sup>3</sup> )
6061-T6 Aluminum	40.0	10000	0.098
7075-T6 Aluminum	73.0	10400	0.102
4130 Cro-Mo Steel	66.7	29700	0.284
Titanium 3-2.5	72.5	14500	0.162
Titanium 6-4	128.0	16510	0.160

Properties of Portaledge materials Credit: deuce4

Next up: Section Modulus, Strength Index, and Flex Index charts...

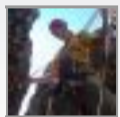


**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 18, 2017 - 08:48am PT

Have I lost everyone? Seems like the thread isn't getting much response lately.



**Rock!...oopsie.**

Trad climber  
the pitch above you

Feb 18, 2017 - 08:55am PT

*Have I lost everyone? Seems like the thread isn't getting much response lately.*

confirmed lurker standing by... carry on please!



**WBraun**

climber

Feb 18, 2017 - 09:07am PT

keep em coming John.

It's interesting stuff and people read your stuff instead of all that daily cesspool politard garbage .....



**stevep**

Boulder climber  
Salt Lake, UT

Feb 18, 2017 - 09:11am PT

At this point, I'm not too likely to ever be using one, but this is interesting from a historical and engineering standpoint. I see similar materials science discussions in bicycle manufacturing. Would using carbon fiber tubes be worth it? Or too much risk of impact damage on the wall?



**Leftwich**

climber

Feb 18, 2017 - 09:14am PT

I'm waiting on pins and needles. This is the best thing going on the internet right now.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 18, 2017 - 09:33am PT

Ok, cool!

In case anyone was wondering, I live in Tasmania, so I'm not up at 1a.m. as my last post per supertopo time suggests, but I do get up early, right now it's 4:30 a.m.

I stopped last night because I wanted to add Carbon Fibre to my list of ledge materials and have been looking for the best engineering data. I once made a ledge from Carbon Fibre with my old A5 portaledge design. But it didn't seem to work well because with block corners, there is a large point load at the joint (where the end tube connects in the A5/BD/Metolius block corners is only 0.8" deep). This is okay for a relatively ductile material like aluminum (which you can also easily double butt with a riveted insert), but for the very stiff and thin carbon/resin tubes, the shallow joint is not kind to the tubing. My new D4 design is actually well set up for a carbon fibre version, and i am building a prototype now, but it's very expensive, even with materials from China. I think Luke at Runout has also made some carbon ledges with the A5 design. More on the carbon fibre friendly designs later, but for now, let's add carbon fibre to our Strength Index and Flex Index list.

Stand by, looks like this site has some decent data :

<https://www.rockwestcomposites.com/round-tubing/round-carbon-fiber-tubing/high-modulus-carbon-tubing>

Hard to find good general data on carbon tubing as it is a carbon/resin composite, and there are so many variables, the way the layers get laid up, etc.

Feb 18, 2017 - 09:39am PT



Reilly

Mountain climber  
The Other  
Monrovia- CA

I would think the cost/benefit analysis of carbon fibre vs titanium would favor the latter as it does in fighter jets.

Humorous aside: I was in a GE F-16 engine factory QC room chatting up the ladies in there and casually plucked a carbon fibre nacelle component ( about 1 SF) off the shelf and asked:

"What's this worth?"

They started laughing and one answered,

"Well, BEFORE YOU TOUCHED IT, about \$1500!"

Oooops!

"Don't worry, we've a nice solvent to clean yer fingerprints off it."



mikeyschaefer

climber  
Sport-o-land

Feb 18, 2017 - 09:57am PT

This is the most fascinating stuff I've read in a long. Keep it coming!



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 18, 2017 - 10:51am PT

Actually, that RockWest data refers only to the carbon fibre fabric. This site looks like it has reasonable estimates of typical carbon fibre composite tubing properties: <http://www.clearwatercomposites.com/resources/Properties-of-carbon-fiber>

Using data from the Clearwater Composites site, let's add the high/low range of carbon fibre to our list:

### Portaledge Material Properties

Material	Y Yield Strength (KSI)	E Modulus of Elasticity (KSI)	Density (lbs/in <sup>3</sup> )
6061-T6 Aluminum	40.0	10000	0.098
7075-T6 Aluminum	73.0	10400	0.102
4130 Cro-Mo Steel	66.7	29700	0.284
Titanium 3-2.5	72.5	14500	0.162
Titanium 6-4	128.0	16510	0.160
Carbon Fibre LowM	300	15000	0.056
Carbon Fibre HighM	250	30000	0.057

Materials with rough estimates of Carbon Fibre properties added

Credit: deuce4

A few things to note: People often just say "titanium" but the range of alloys is considerable with widely varying properties, as noted above in the Grade 5 vs Grade 9 titanium. Same with carbon fibre. The chart I used to get the carbon values has inconsistent data for other materials, i.e. a ultimate strength, rather than yield, for 4130, which is highly dependent on heat treatment, and lists less than the typical yield for 6061-T6, which is a very specific material and heat treatment. But all the metal material properties above are from the Matweb site, which is consistent (for 4130, I used the "normalised" specs, which is what Aircraft Spruce documents as the typical aircraft tubing treatment). So the carbon fibre specs above are to be taken with a grain of salt, but they seem reasonable (note also that carbon fibre strength decreases with increased Elastic Modulus). By the way, Aircraft Spruce is another great resource for learning about tubing and the common sizes available:

[https://www.aircraftspruce.com/categories/building\\_materials/bm/menus/me/index.html](https://www.aircraftspruce.com/categories/building_materials/bm/menus/me/index.html)



matty

Trad climber  
under the sea

Feb 18, 2017 - 10:58am PT

Thanks for sharing John!!

Really enjoy reading and learning, I'm a physicist and it's nice to get a peek into the more technical engineering stuff. Keep it coming!



nah000

climber  
no/w/here

Feb 18, 2017 - 11:39am PT

yeah, don't be discouraged by the lack of responses...

just because there is less to comment on, when someone with actual knowledge takes the time to edumicate the rest of us plebs, doesn't mean there isn't an intrigued but silent audience...

looking forward to continued posts and thanks for all of the knowledge you've already shared...



Feb 18, 2017 - 11:47am PT

^^^^^^ :)



**Caveman**

climber  
Cumberland Plateau



**stevep**

Boulder climber  
Salt Lake, UT

Feb 18, 2017 - 11:56am PT

I was thinking about that same joint issue with CF at the corners that you mentioned. Trying to connect bare tubes to metal corners wouldn't work very well. But you could use industrial epoxy to bond metal ends on to the CF tubes and then joining those to metal corner pieces would seem doable.

I don't think straight-wall HM CF tubing is too expensive. Certainly cheaper than Ti. But might not be as cost effective as 7075-T6 Al.



**nathanael**

climber  
CA

Feb 18, 2017 - 12:00pm PT

following closely, thanks



**wayne burluson**

climber  
Amherst, MA

Feb 18, 2017 - 02:03pm PT

This is really good stuff John!  
And better writing and simplified math than many engineering profs! :)  
Looking forward to more.

-wayne (in Switzerland with my kids now)



**looks easy from here**

climber  
Ben Lomond, CA

Feb 18, 2017 - 02:21pm PT

Another lurker checking in. I don't know enough to ask any reasonable questions, but I know enough to understand you and be interested.



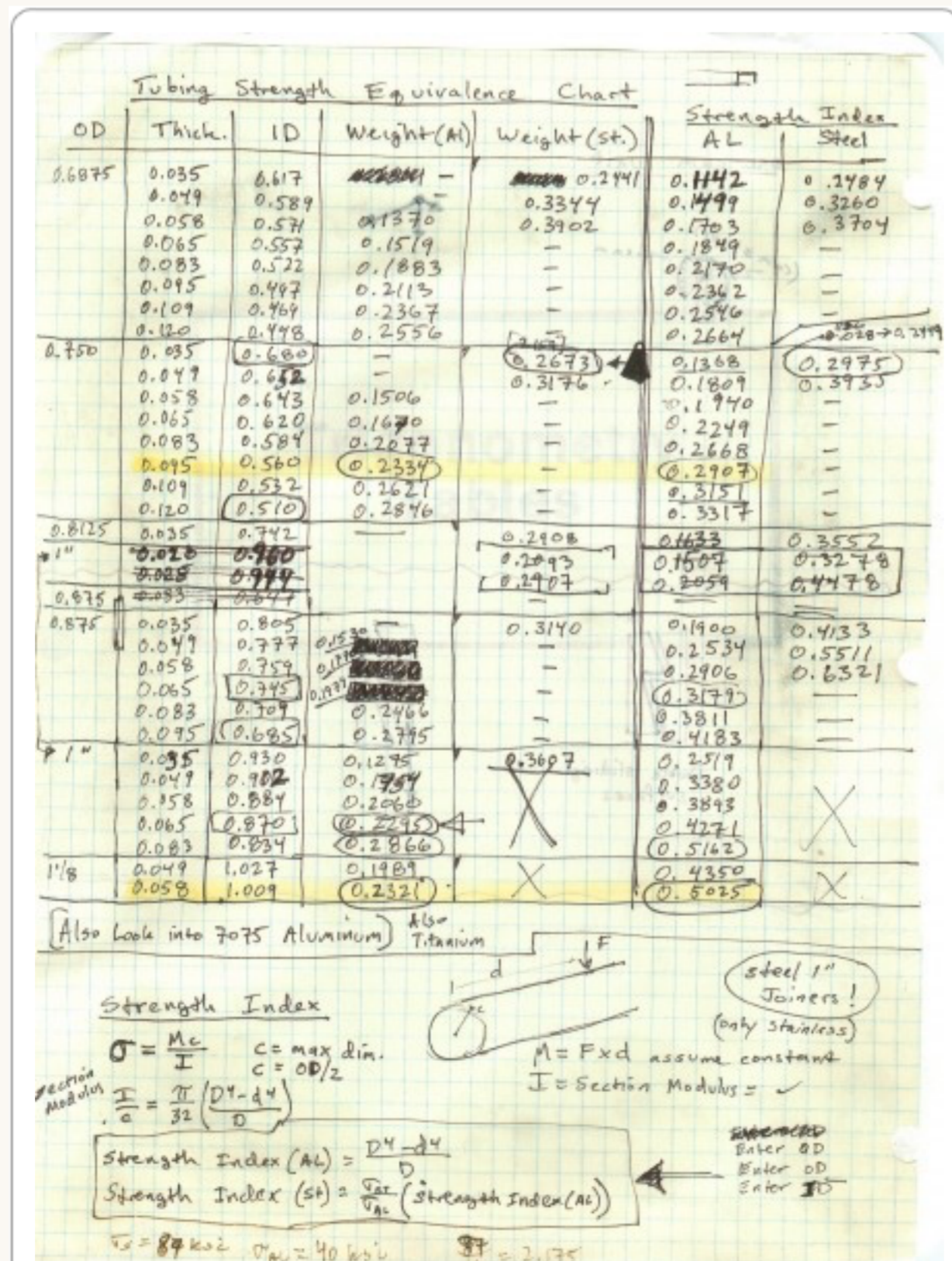
**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 18, 2017 - 02:30pm PT

Wish I could "Like" all your posts, very encouraging. Thank you.

I am trying to create, for the benefit of the community (including other manufacturers!), but also for myself, a clear and concise way to think about these engineering aspects. As an aside, I look at my old notes from the A5 days, and though they served me well to optimise the design of the time, it's hard even for me to make heads or tails of them these days. For example, below is a reference chart I used for years to consider other tubing sizes, as well as joints and other aspects of portaledge tubing design (i.e. double butting):



from the 80's (pre-personal computer!). Kind of a mess, but it was an essential chart that provided a lot of information not only for overall design, but also, for example, how to make joiners stronger than main tubing (an essential portaledge feature)

Credit: deuce4



Or this when I was looking into Titanium:

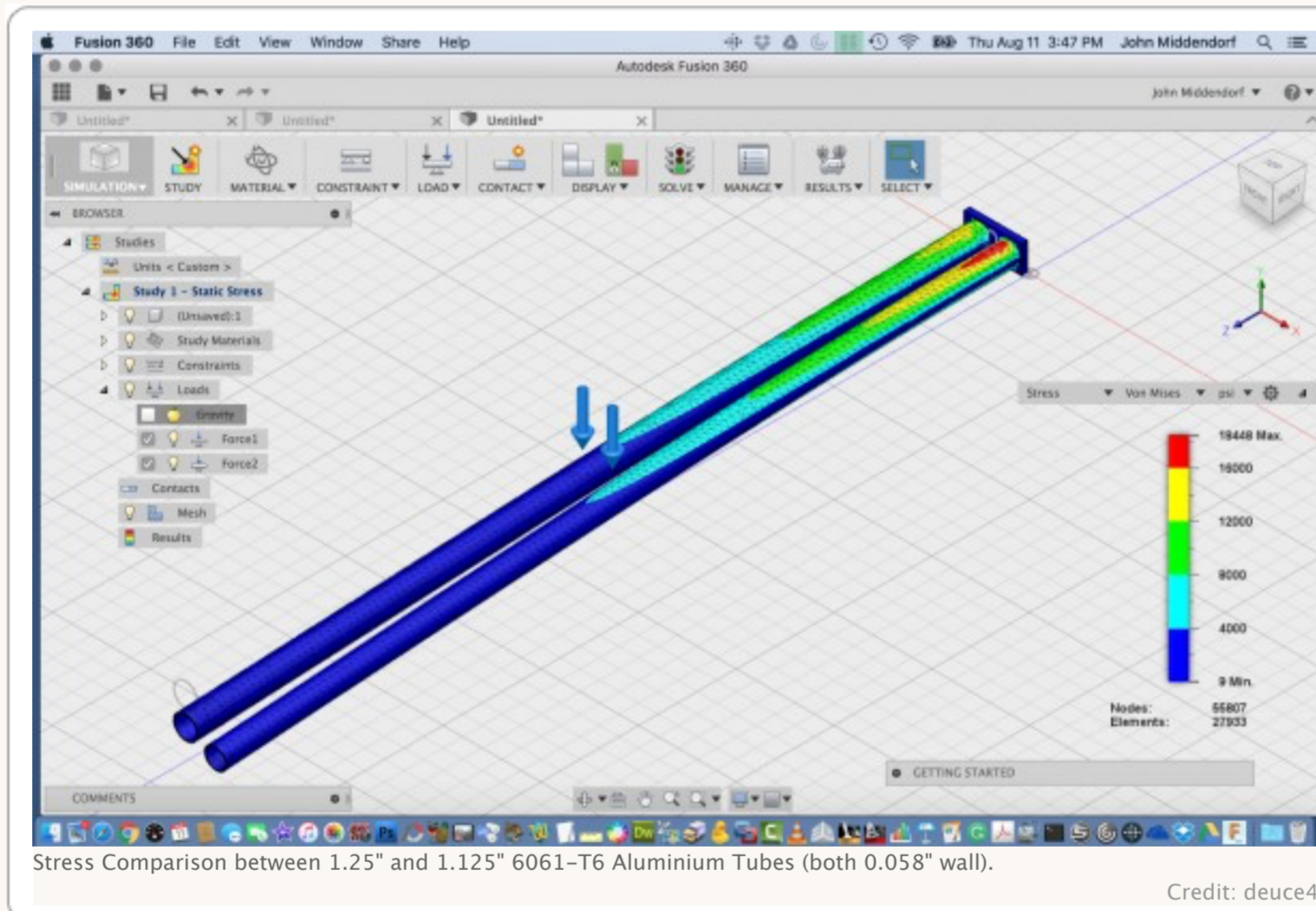
**Aluminum/Titanium Comparison**  
 Aluminum = 1/8, 0.058 wall 6061-T6. Titanium: 1", 0.058 wall, 3/25/76.  
**Specs Required**  
 • Strength (ultimate or yield?)  
 • Modulus of Elasticity (Young's Modulus) [E]  
**Strength**  
 Tensile Strength  $\rightarrow \sigma = \frac{F}{A}$  ( $A = \pi(d_o^2 - d_i^2)/4$ )  
 Strength in Bending  $\sigma = \frac{My}{I}$   $M = moment = F \cdot d$   
 $I = \text{moment of inertia} = \frac{\pi}{64}(d_o^4 - d_i^4)$   
**Buckling**  
 $P_{cr} = \frac{\pi^2 EI}{L^2}$  Buckling = function(E, I)  
**Deflection**  
 $y_{max} = \frac{FL^3}{48EI}$  Deflection = function( $\frac{1}{EI}$ )  
 simple supports - center load  
**Distorting: function of hardness?**  
**Data Yield**  $E = 10.5 \times 10^6 \text{ psi}$  Hardness = Min 26.5  
 Titanium Tensile 155 ksi (Yield 145 ksi) 6Al 2V Ti Heat Treated  
 6061-T6: 45 ksi Tensile / 40 ksi Yield  
 Aluminum Modulus of E  $\rightarrow 10.5 \times 10^6 \text{ psi}$  Hardness 95 BHN  
**Research: Different Heat Treats = 6 3Al 2.5V Ti.**  
**Titanium vs. Aluminum Tubing Comparison**  
**Best Specs**  
**Aluminum:** 6061-T6 1/8" OD, 0.058 wall, 1001" ID  
 • Yield Strength = 40 ksi.  
 • Young's Modulus = E =  $10.3 \times 10^6 \text{ psi}$   
 •  $\frac{E}{\rho} = 11 \rightarrow (\frac{BHN}{173})$  A measure of rigidity.  
 •  $\frac{W}{L} = 0.2521 \text{ lbs/foot}$   
 •  $I = \frac{\pi}{64}(d_o^4 - d_i^4) = 2.775 \times 10^{-12}$   $A = 0.1192 \text{ in}^2$   
**Titanium:** 3Al 2.5V Ti 1" OD, 0.058 wall, 0.9990" ID  
 • Yield Strength = 85 ksi (low estimate, see heat treat)  
 • Young's Modulus =  $15.5 \times 10^6 \text{ psi}$   
 •  $\frac{E}{\rho} = 17 \rightarrow (\frac{BHN}{269})$ . Much Harder - resistant to dents.  
 • Weight per foot = 0.673 lbs/ft.  
 •  $I = \frac{\pi}{64}(d_o^4 - d_i^4) = 1.011 \times 10^{-11}$   $A = 0.0850 \text{ in}^2$

Property	Aluminum	Titanium
Strength Tensile $\rightarrow$	40 ksi	85 ksi
Strength Bending $\rightarrow$	M = 986.7 lb	M = 259.9 lb
Buckling Factor: $\frac{E}{\rho}$	11	17
Deflection Factor: $y_{max}$	2.775	1.011

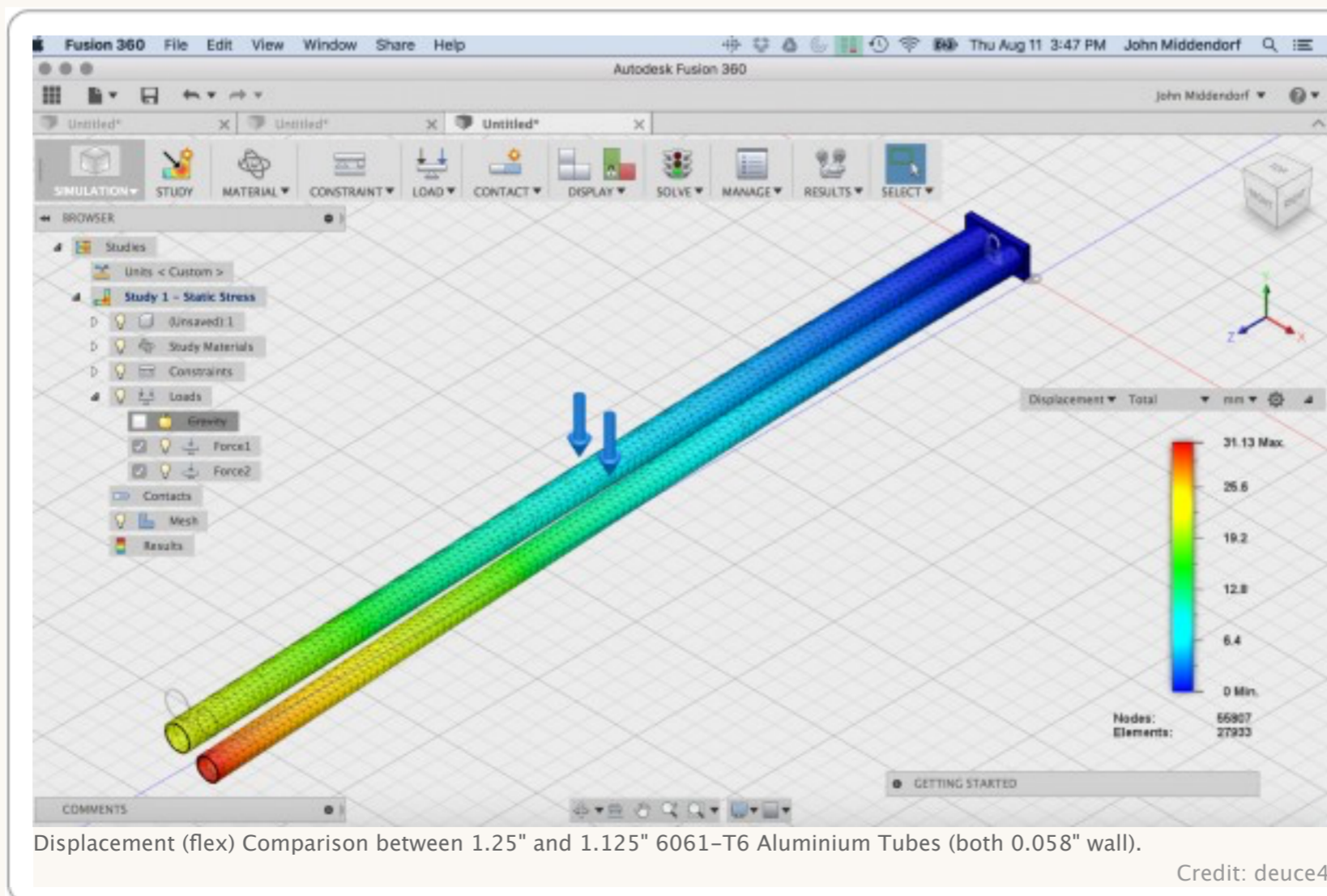
initial engineering notes for A5 titanium ledges, circa late 1980's

Credit: deuce4

But I am hoping to make it more clear now. Just to note, a lot of my recent work and conclusions came from playing with FEA (Finite Element Analysis) tools such as the quick analysis I did in the stress/displacement pics below, but analysing using FEA is more an interactive process and actually challenging to document in a clear way (see previous FEA video for example, still probably a bit too much "engineering" stuff).



Credit: deuce4



Credit: deuce4

But I digress (again!). And I am giving away more than I wanted to this point--was hoping for more of a surprise at the solution of eliminating spreader bars, but which I will get to soon.



to be continued...

EDIT: here's a link to an amazing tool--Autocad Fusion. I used a lot of different FEA tool in the past 15 years of my engineering, starting with Patran/Nastran (not user friendly!) when I was studying for my Masters of Engineering at UNSW in 2003, but Autocad Inventor is really, really good for relatively easy analysis (for design, I prefer Autocad Inventor, but Fusion is ok for solid modelling, too).

<http://www.autodesk.com/products/fusion-360/overview>



Rhodo-Router

Gym climber  
sawatch choss

Feb 18, 2017 - 02:35pm PT

I met a guy who makes bamboo bicycle frames with CF corners.



duncan

climber  
London, UK

Feb 18, 2017 - 03:03pm PT

*Have I lost everyone? Seems like the thread isn't getting much response lately.*

Watching and thinking! To increase rigidity you've changed some combination of the frame material, or the frame cross-section, or the frame design in some way.

You've implicitly ruled out Ti as a material which leaves carbon fiber or larger diameter aluminum tube. As I was writing this you've discussed carbon fiber composite, which was my original guess, but that seems not on the table for now. Larger diameter, thinner walled, aluminum tubing would be stiffer for the same weight, but be easier to dent. Would this work?

Regarding frame cross-section, from the picture and all your sketches it looks like you're still using round section tubes, so not something like I-beam. I guess I-beams would be better at resisting bowing if it was a simple beam application but it's not. Oval cross-section tubes, angled down and in, so the direction of pull of the bed material is along the long axis of the oval? These would be stiffer than round section tube but harder to implement, certainly if you continue to use corner blocks.

The bed shape is still rectangular, so not something fundamentally different like an oval (you have a pesky rock wall to deal with, most of the time). I wondered if you could somehow preferentially load the short side of the rectangle with the bed material, a bit like a hammock, but couldn't think of how you could do this and it wouldn't work with a bunch of people all on the same ledge. This suggests you've changed the frame design in some other way. Could the long sides be pre-curved - bowed outwards subtly - so that loading the bed material would bend it back to a rectangle - or would this make assembling too difficult?

Interested to hear about the solution.



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 18, 2017 - 03:08pm PT

Nice input Duncan, and cool ideas.

The solution is actually much simpler than you'd imagine! But it works, and keeps the ledge light.

When I eventually reveal the solution to eliminating the spreader bar (and an easy way for companies using the block-corner design to revamp production without having to redesign the fabric parts--and save on cost, too), it will likely seem obvious. But I guess not so obvious that for the past 20 years the two major producers of portaledges have opted for a spreader bar solution to flex ;).

By the way, this structural aspect is only one of the four main innovations of my new design, the [D4 Portaledge](#).

back soon.



BLUEBLOCR

Social climber  
joshua tree

Feb 18, 2017 - 04:05pm PT

You did crew John. Those CF oars are strong and light as shite. The oars we had at UCSB were 12'-9" X +/-2" dia. Granted a couple feet of that are the blade and handle. Made from balsa the handle's are lathed to fit inside the CF tube about 2". Maybe for a ledge, instead of the tubes goin inside the corner's. The corner goes inside the tubes?

i like your new logo, that's bitchn bob 😊



Moof

Big Wall climber  
Orygun

Feb 18, 2017 - 06:30pm PT

Bump for the best non-Trump thing on here.

A few years back a one many shop called Burley Equipment made an A5 knock off with a 2:1 on the strap (also made a burley "Love Swing"). They disappeared after less than a year. Seems like something that needs to become standard. Dialing in the ledge flatness on a double is a real pain with a fatso like me sharing it.

For my CF ledge I double butted the ends with some 0.058" 1" OD for fear of the ends shattering under rough use and used structural epoxy to bond them (expensive stuff). At the side joints I put external as well. Added more weight than I should have, but without much of an ME background or any mechanical FEA available, what are you going to do?

BTW, is that Ansys in your screenshots? Any recommendations on hobby budget FEA tools that are worth the hassle and money? I use FEM electromagnetic tools in my day job (including Ansys HFSS), so I have a rough idea how ugly the learning curve can be.



edavidso

Trad climber  
Oakland, CA

Feb 18, 2017 - 09:55pm PT

As a mechanical engineer myself, I'm really enjoying this thread. Also interested to see where it is going. A couple of comments on the technical discussion:

Your numbers for the carbon fiber tubes are not that far off. Carbon fiber, however, has a few differences from metals that should be taken into account. One is that it is an orthotropic material, meaning its material properties are different in three orthogonal directions. Metals are considered isotropic (material properties consistent regardless of direction).

For a tube in bending, this means the bending stiffness will be a little lower than the modulus in the longitudinal direction indicates. Another relevant difference is that unlike metals, which generally have the same strength in tension and compression, the compressive strength of composites is less than the tensile strength. A tube in bending will be in compression on one side and tension on the other so the design should be based on the compressive strength. For HS carbon fiber (low modulus), this will be closer to 200 ksi. For HM carbon fiber, it will be around 160 ksi. In either case, the modulus and strength will depend on the exact layup and fiber used as you've previously mentioned.

To simplify the technical discussion, you could use thin wall approximations for the second moment of area (area moment of inertia). For a thin wall tube,  $I = \pi R^3 t$ . This is a little more intuitive and will actually be pretty close for the calcs for these tubes.

I like to think of stiffness in terms of load per deflection, just like a spring. Many are familiar with  $F = k \cdot x$  for a spring, where  $F$  is the load,  $k$  is the stiffness and  $x$  is the deflection. You can treat a beam in bending in the same manner. Stiffness,  $k$ , then is proportional to  $E \cdot d^3 t / l^3$ , where  $E$  is modulus,  $d$  is diameter,  $t$  is tube thickness and  $l$  is tube length. This shows that stiffness for a tube in bending is a combination of a material property ( $E$ ) and geometrical properties ( $d$ ,  $t$ , and  $l$ ) and that  $d$  and  $l$  are the primary contributors as they are cubed.

More important for this discussion might be bending stiffness per tube weight. Using thin wall approximations for " $I$ " and weight, you get that  $k/W$  is proportional to  $E \cdot d^2 / (l^4 \cdot \rho)$ , where  $\rho$  is the material density. Again, this is a combination of material and geometrical properties, for material the important parameter is ( $E/\rho$ ) and for geometry it boils down to  $d^2/l^4$ . Intuitively this should make sense – to increase stiffness per weight you want to increase modulus, decrease density, increase tube diameter, and decrease tube length.

Sorry, that ran a little longer than I wanted but hopefully it made some of the engineering concepts a little easier to understand for some.



**BLUEBLOCR**

Social climber  
joshua tree

Feb 18, 2017 – 10:41pm PT

^^^that was cool, thanks:)



**Mike.**

climber

Feb 19, 2017 – 07:32am PT

Thanks for the running additions to the thread, Deuce and all.

I'm curious to know what, if any, of these advancements/thinking might filter down to a single ledge. Is there room for improvement of singles?

Doubles are clearly the tool of choice for most teams, hence the focus on a spreader bar, and I don't intend to introduce the double vs. single debate.

I've owned both the larger 4-point design and "Super-light" A5 singles – both great tools but no longer have the 4-point. Aside from size, the main difference is the side rails braking down to two vs. three sections. Is my single still state-of-the-art?



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply – Feb 19, 2017 – 11:53am PT

Great! Was hoping more engineers would chime in with good info.

I agree about the carbon fibre--I wasn't sure how I would incorporate the lesser compressive strength of carbon fibre in the bending analysis, so lets just use edavidso's numbers.

So here's a revised property chart, with links. Appreciate the input. Next up I intend to create a Strength Index and Flex Index for typical portaledge designs (note: this is way taking longer than I expected-- it takes too long, I'll just cut to the chase soon and post up the new innovation).

Portaledge Material Properties

Material	Y Yield Strength (KSI)	Ultimate Strength (KSI)	E Modulus of Elasticity (KSI)	Density (lbs/in³)	Source
6061-T6 Aluminum	40.0	45.0	10000	0.098	<a href="http://www.matweb.com/search/DataSheet.aspx?MatGUID=b8d536e0b9b54bd7b69e4124d8f1d20a">http://www.matweb.com/search/DataSheet.aspx?MatGUID=b8d536e0b9b54bd7b69e4124d8f1d20a</a>
7075-T6 Aluminum	73.0	83.0	10400	0.102	<a href="http://www.matweb.com/search/DataSheet.aspx?MatGUID=4f19a42be94546b686bbf43f79c51b7d">http://www.matweb.com/search/DataSheet.aspx?MatGUID=4f19a42be94546b686bbf43f79c51b7d</a>
4130 Cro-Mo Steel	63.1	97.2	29700	0.284	<a href="http://www.matweb.com/search/DataSheet.aspx?MatGUID=e1cceb90cf94502b35c2a4745f63593">http://www.matweb.com/search/DataSheet.aspx?MatGUID=e1cceb90cf94502b35c2a4745f63593</a>
Titanium 3-2.5	76.9	89.9	14500	0.162	<a href="http://www.matweb.com/search/DataSheet.aspx?MatGUID=2710548c162947fb90d7199aaa24226f">http://www.matweb.com/search/DataSheet.aspx?MatGUID=2710548c162947fb90d7199aaa24226f</a>
Titanium 6-4	128.0	138.0	16510	0.160	<a href="http://www.matweb.com/search/DataSheet.aspx?MatGUID=a0655d261898456b958e5f825ae85390">http://www.matweb.com/search/DataSheet.aspx?MatGUID=a0655d261898456b958e5f825ae85390</a>
Carbon Fibre LowM		200	15000	0.056	various
Carbon Fibre HighM		160	30000	0.057	various

revised properties based on edavidso's carbon fibre input

Credit: deuce4

EDIT: clickable links for the above chart:

6061-T6 <http://www.matweb.com/search/DataSheet.aspx?MatGUID=b8d536e0b9b54bd7b69e4124d8f1d20a>

7075-T6 <http://www.matweb.com/search/DataSheet.aspx?MatGUID=4f19a42be94546b686bbf43f79c51b7d>

4130 N <http://www.matweb.com/search/DataSheet.aspx?MatGUID=e1cceb90cf94502b35c2a4745f63593>

Ti Grade9 <http://www.matweb.com/search/DataSheet.aspx?MatGUID=2710548c162947fb90d7199aaa24226f>

Ti Grade5 <http://www.matweb.com/search/datasheet.aspx?MatGUID=a0655d261898456b958e5f825ae85390>

ps: there's a lot of people who it would be nice to contact directly in response to their posts and input, but the



(edited again...)



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 19, 2017 - 02:27pm PT

Making some progress on presentation. Here is a chart showing relative strengths of tubing. Note that this does not take into account the length of the frame, which is important specification for the bending stresses, I will try to incorporate that later.

**Strength Index Chart for Typical Portaledge Frame Materials**

TUBING	OD	wall	ID	Material Strength (KSI)	Section Index (OD <sup>4</sup> - ID <sup>4</sup> )/OD	STRENGTH INDEX = Section Index * Material Strength	Density lbs/in <sup>3</sup>	Weight per foot (lbs)	Weight per 24 feet (lbs)	Strength/Weight INDEX
6061-T6 Alum 1.125/0.058 (A5)	1.125	0.058	1.009	40	0.5025	20.1	0.098	0.23	5.52	3.6
6061-T6 Alum 1.25/0.058 (D4)	1.25	0.058	1.134	40	0.6302	25.2	0.098	0.26	6.24	4
6061-T6 1.125/.083 (A5 Cliff Cabana)	1.125	0.083	0.959	35	0.672	23.5	0.098	0.32	7.68	3.1
7075-T6 Alum 1.0/0.049 (A5)	1	0.049	0.902	66	0.338	22.3	0.102	0.18	4.32	5.2
4130N Steel 0.875/0.035 (Fish)	0.875	0.035	0.805	97	0.19	18.4	0.284	0.31	7.44	2.5
Titanium 3-2.5 1/0.35 (A5)	1	0.035	0.93	72.5	0.2519	18.3	0.162	0.21	5.04	3.6
Titanium 6-4 1/0.028 (A5)	1	0.028	0.944	128	0.2059	26.4	0.160	0.16	3.84	6.9
Carbon LowM sm	1	0.05	0.9	200	0.3439	68.8	0.056	0.1	2.4	28.7
Carbon High M lg	1.1	0.065	0.97	150	0.5262	78.9	0.057	0.14	3.36	23.5

Strength Index for typical portaledge frame materials (copyright John Middendorf) Credit: deuce4

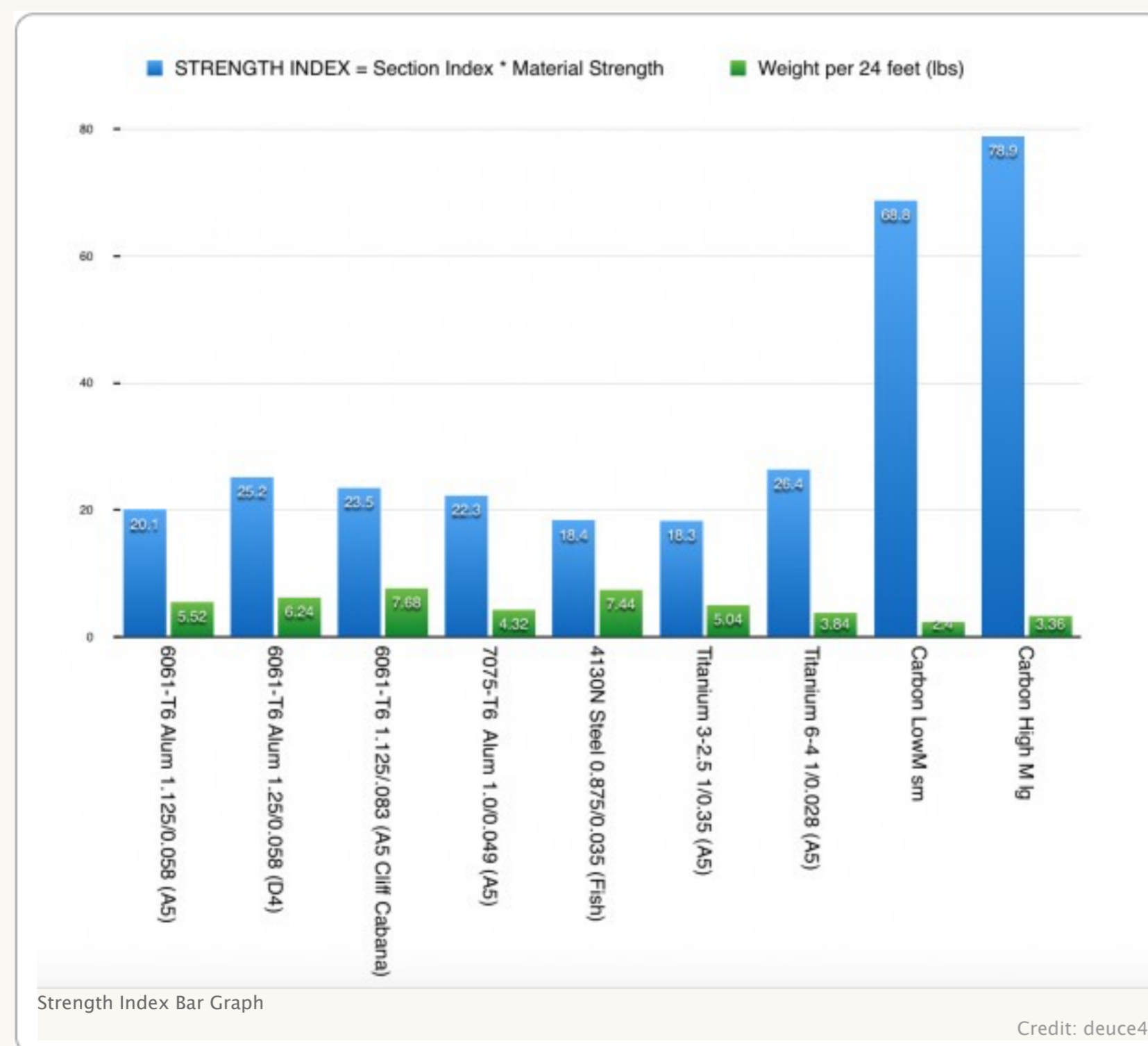
The "Strength Index" incorporates the engineering aspects, and is useful for comparison.

$$StrengthIndex = \left( \frac{OD^4 - ID^4}{OD} \right) \sigma$$

Middendorf's "Strength Index", a simplified way to compare a tube's ability to resist stress failure based on the tube geometry and material strength.

Credit: deuce4

The above chart in bar graph form:



I consider the first tubing, 1.125"OD, 0.058" 6061-T6 aluminium the baseline--it is certainly the material that most portaledges (probably going on 10,000 ledges by now) have been made from, and has been proven to work well without spreader bar for a 43" x 75" ledge.

But remember that we're not just looking at strength--we need to consider flex as well. Coming soon...

By the way, I am just now experimenting with carbon fibre again (those sizes listed above)--need to glue or rivet some aluminium ferules to the ends of the carbon fibre--any suggestions?

Also, here's edavidso's boiled down formula from [latex editor](#):

$$\textit{Stiffness/weight} = E * OD^2 / (L^4 * \rho)$$

edavidso's equation

Credit: deuce4

*Intuitively this should make sense - to increase stiffness per weight you want to increase modulus, decrease density, increase tube diameter, and decrease tube length.*

Good thing to keep in mind for next part of discussion...

Edit: not sure if E, the elastic modulus (aka Young's Modulus) has been properly explained--will try to include...

Edit2: revised A5 Great Trango Titanium ledge--measured it, it is actually 0.035" wall (the one for Catherine Destivelle was the stronger, thinner wall 6-4 material)



Moof

Big Wall climber  
Orygun

Feb 19, 2017 - 03:45pm PT

I used Hysol 9340 structural adhesive for my CF ledge. Seems to be burly stuff.

A CF tip: If re-inforcing the corners internally like I did (paranoia...) pre-cut an oversized hole in the aluminum, then use a diamond tip hole saw for the bungie hole. Diamond drill works great on CF, badly on aluminum. CF is terrible on non-diamond tips.

Oh yeah, measure twice, then measure again, then mockup, then cut your CF. CF is REALLY pricey to eff up on.



corners

Credit: Moof

I am all for smaller ledges too. The hard part for me was wanting to just buy a fly. I got a couple A5 Cabana ones, and a simple ACE one for cheap, so it is far easier to make the ledge match the cheap flies than to deal with that much more seamstressing.

I am diddling around with tensioning ideas. I want to try using about a dozen or more small d-rings with some 1/2" webbing (smaller?) to really be able to get some mechanical advantage when bed tensioning and to spread out the stress. The original A5 patterns your posted had the reinforcing triangles aligned with the pattern of the bed (not on the bias). This creates quite a stress riser at the interface between the bed and the triangle. Cutting these on the bias (or better, use diamond patches) would better use the patches to spread the tension over a wider area of the bed making stories of knees poking through beds less likely.

On the bed sides I found that edge binding sucks, and for 2 reasons. First it is hard for small one time operations to get it right (pre-iron the tape in half!). Second, if you edge bind and then just fold/sew to make the passage for the frame half tension is held by the very end weave of the bed, yikes! So I use an attachment that does 1/2" single edge bind (folds over and sews, no tape), then fold that over and sew. It makes it much harder for the stitches to pull through under load. You also then only have to tape bind the corners and cutouts, which are much shorter and easier for hobby grade fooling around.

Wayback link to old discussions on bigwalls.net:

<http://www.bigwalls.net/forumStatic/index-topic=217.msg1570.php.html#msg1570>



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 19, 2017 - 04:42pm PT

cool stuff, Moof, sounds like you are really dialling it in. And thanks for the tips on the CF to aluminium glue. My application is for a joiner which isn't in direct stress--I suspect I will have to go to glue, but right now I am experimenting with a rivet, but sandwiching the CF between two layers of aluminium so the rivet ends are not in direct contact with the CF.

Edit: the rivet solution seems to be working--not sure how much I have weakened the underlying carbon, but since the joint essentially is triple butted, seems ok. Not sure about breathing that carbon dust from drilling it though...





**BLUEBLOCR**

Social climber  
joshua tree

Feb 19, 2017 - 07:41pm PT

Moof, those look *really* nice. Good job!



**Moof**

Big Wall climber  
Orygun

Feb 19, 2017 - 08:28pm PT

Another learning that I made the hard way is to angle the center shark fin MUCH more than you think you need to. I did my first floor +/-4" from the center line, which was way too little. Your feed need so much less than your shoulders. 6-8" offset from centerline on each end is a good target.



**edavidso**

Trad climber  
Oakland, CA

Feb 19, 2017 - 09:39pm PT

John, your strength index seems like a good way to compare relative strengths of specific tubes as it describes the max moment each can take before yield. Length will also be important as you mentioned.

The formulas from my previous post allow one to make comparisons between tubes loaded in the same manner. For example, if you wanted to compare the stiffness/weight for a steel tube and aluminum tube of identical dimension and loading, the equation would be  $S/A = ((E_s \cdot OD_s^2) / (L_s^4 \cdot \rho_s)) / ((E_a \cdot OD_a^2) / (L_a^4 \cdot \rho_a))$ . OD and L cancel out since they are the same for this example and you're left with  $(E_s \cdot \rho_a) / (E_a \cdot \rho_s) = (29700 \cdot .098) / (10000 \cdot .284) = 1.02$ . So all else being equal, stiffness/weight for steel is 1.02X that for aluminum. In other words, steel and aluminum are nearly identical for this metric. You can use the equations to compare any other parameter of interest. These equations are good for comparisons only - to calculate actual values with units you'd need to know the loading and boundary conditions and then add the relevant constants to the equations.

Moof, nice looking carbon tubes with end fittings!

In the past I've bonded carbon fiber to metal using Hysol 9359.3. I think you'd be fine just using an outer aluminum sleeve bonded to the carbon. The inner sleeve would only be necessary if you had a very high compressive radial load. It is important for gluing carbon to metal that you leave a bond gap for the glue to fill. The bond gap is normally 0.01" to 0.025".

If drilling into carbon, Moof is right on with the diamond coating. You can also use carbide tooling but it will wear faster. Rule of thumb for drilling holes into carbon is to space the hole 4 diameters from the nearest edge. So for a 1/4" hole, you'd want the center of the hole at least 1" from the edge of the tube.



**Plaidman**

Trad climber  
West Slope of Powell  
Butte, Portland,  
Oregon, USA

Feb 20, 2017 - 06:23am PT

John thx for sharing all these details. This is really cool stuff.  
I'm trying to get one of my design engineer/climbing partner to chime in.

Plaid



**Woody the  
Beaver**

Trad climber  
Soldier, Idaho

Feb 20, 2017 - 08:59am PT

This is good smart fun! I enjoy reading this thread! Thanks.



**Moof**

Big Wall climber  
Orygun

Feb 20, 2017 - 10:36am PT

I did a batch of the corner pieces for 1 1/8" tubing a number of years back, still have a bunch extra. I am gradually getting a little more free time now that the kid is getting a bit older. I need to get back on the horse and get my hobby room dusted off...



**WBraun**

climber

Feb 20, 2017 - 10:43am PT

Thanks Moof for the loctite Hysol glue info.

I just ordered the 608 version and will glue Yosemite back together to make it great again .....



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 20, 2017 - 11:24am PT

Still working on the next installment. One important thing to note about the stiffness/weight formula is that it has nothing to do with the strength of the material. So even though a 1" OD, 0.049" wall 7075 aluminum ledge is stronger than a 1.125" OD, 0.058" wall 6061 aluminum tubing (see above Strength Index chart), we will see that the smaller tubing 7075 ledge will flex more due to its tubing cross-section geometry. Note that all aluminum alloys have similar E values, regardless of the difference in strength.

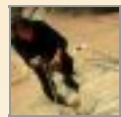
Getting a grasp on the E value is important. E, the modulus of elasticity, also known as Young's modulus, can be thought of as the springiness of the material. Low E, very springy; high E, very stiff. Rubber bands have very low E, steel has high E. But even though, as edavidso points out, aluminum and steel have similar stiffness/weight ratios, note also that the Outside Diameter of the tubing is squared in the stiffness/weight equation. So theoretically you could make a steel portaledge frame as stiff as aluminum with same weight, but the steel one would have to have a very thin wall to be of similar weight.

That brings another failure factor to consider in portaledge tube design: buckling--with ledge tubing if you make the tubing wall too thin, then a buckling failure mode comes into play (you can see the formula on my titanium notes some pages back). I'm not planning to cover the engineering formulas and analysis for buckling here, but as a rule of thumb, I found that anything less than 0.028" tubing wall thickness, even with a strong, high E material, is too thin for

portaledges due to buckling potential after even a tiny dent.

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John Middendorf  
<http://www.johnmiddendorf.net>



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 20, 2017 - 01:46pm PT

Maybe some feedback? Are these indexes making sense? Here is the next one.

$$FlexIndex = \frac{L^3}{E * SI * OD} = \frac{L^3}{E * (OD^4 - ID^4)}$$

Flex Index. In the first one, the SI is the same as the section index used in the strength comparison. The second one is the Flex Index in its simplest form.

Credit: deuce4

Note that flex will be determined by the length of the tube, the cross-section geometry, and the material stiffness.



'Pass the Pitons' Pete

Big Wall climber  
like Ontario,  
Canada, eh?

Feb 20, 2017 - 03:33pm PT

*"Have I lost everyone? Seems like the thread isn't getting much response lately."*

Well, it \*IS\* a lot of asbestos and marmalade...

I've made it as far as the cubic relation of length to deflection. Makes sense.

[shameless bump to keep this on the front page, will catch up on the rest of the posts]



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 20, 2017 - 03:42pm PT

Thanks, Pete! Almost ready for the finale on D4 innovation #1 (elimination of the spreader bar on a 'full-size' ledge), so we can then move onto the one you've been waiting for, innovation #2 (corner design).



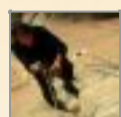
'Pass the Pitons' Pete

Big Wall climber  
like Ontario,  
Canada, eh?

Feb 20, 2017 - 03:50pm PT

I'm paying rapt attention. Couldn't read on my smart phone, had to pull out the laptop. I need to follow carefully so I don't miss anything.

Have you posted up your Facebook video on this thread yet????



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 20, 2017 - 03:55pm PT

Ok, here we go:

$$FlexIndex = \frac{L^3}{E * (OD^4 - ID^4)}$$

The Flex Index

Credit: deuce4

Flex Index for Double Portaledges (lower numbers are better)

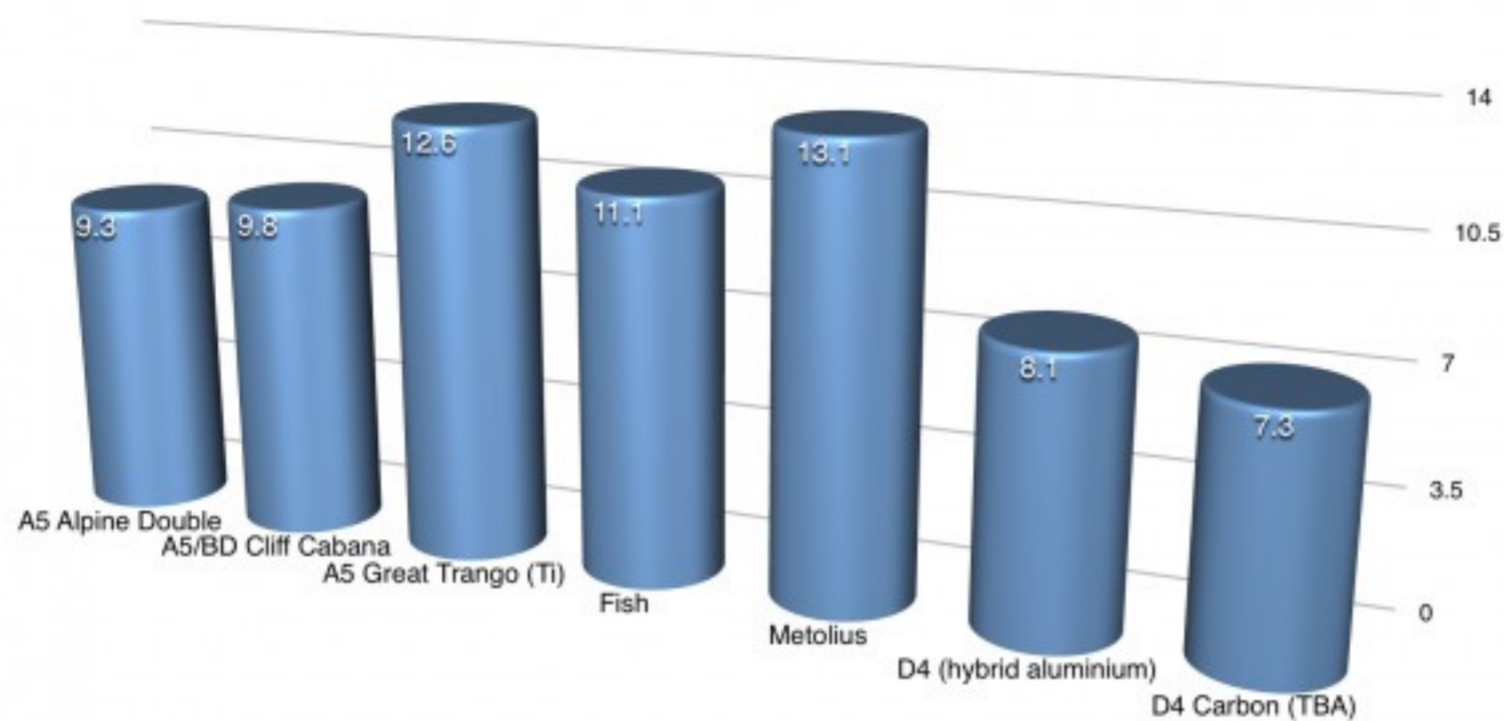
	OD	Wall	ID	Length	L/2	Material E	FLEX INDEX
A5 Alpine Double	1.125	0.058	1.009	75	37.5	10000	9.3
A5/BD Cliff Cabana	1.125	0.083	0.959	84	42	10000	9.8
A5 Great Trango (Ti)	1.00	0.035	0.93	75	37.5	16510	12.6
Fish	0.875	0.035	0.805	76	38	29700	11.1
Metolius	1.125	0.058	1.009	84	42	10000	13.1
D4 (hybrid aluminium)	1.25	0.058	1.134	80	40	10000	8.1
D4 Carbon (TBA)	1.10	0.065	0.97	80	40	15000	7.3

Middendorf's "Flex Index", a tool to help compare portaledge tubing types for design.

Credit: deuce4



**Flex Index for Portaledge (lower numbers are better—less flex)**



Flex Index Bar Chart

Credit: deuce4

A few things to note here. First, it is easy to see why Metolius needed the spreader bar--they increased the length of the ledge, but did not re-design the tubing of the frame and thus have the highest flex index of any ledge commercially made (note: I am not 100% certain that they are still using the 0.058" wall tubing--perhaps they have bumped it up). Regardless, the 1.125" OD tubing is just not the right size for a ledge that is longer than 75".

You might ask why didn't I design the Cliff Cabana back in the 1990's with bigger outside diameter tubing, rather than stick with the 1.125" OD with beefed up thickness--well, as I mentioned, we had a lot of infrastructure already invested in the 1.125" corners (made from 1.375" square Aluminum bar stock), and I never really considered the Cliff Cabana a mainstream design--it was really for the 3-person Diamond Ledge, a very specialised tool for high wind situations, where weight might not be a critical factor. My design of the Cliff Cabana was kind of a shortcut--beefing up the tubing thickness to 0.083" made sure it had higher strength and similar stiffness as the proven Alpine Double without having to redesign the whole frame system from scratch. (Note: the original Cliff Cabana was fine with three people without a spreader bar--perhaps a bit more flexy with the additional person, but not overly so. I suspect the reason that BD later adopted the spreader bar was that they also adopted Metolius's open corner system which, as mentioned before, adds to the flex of the system). By the way, I never thought we would sell more than a few Cliff Cabanas, so I am surprised that most of the recent portaledge fame and glory (i.e. full page NYT pictures of Tommy Caldwell on the Dawn Wall) is all about that design.

What you can see here pretty clearly is that the 1.25" OD 0.058" wall is really the best metal tubing of those listed to use for a larger ledge. But an issue with the traditional A5 design now used by BD and Metolius is be that switching to 1.25" OD tubing would require larger block corners, which would significantly increase the weight of the ledge. Something perhaps to note in the discussion of titanium, is that though the tubing weight for our Titanium Great Trango ledge only saved 1/2 pound, one might think it wasn't worth it with all the added flex; but because the corners were much smaller and lighter for the 1" tubing, there were other weight savings and the ledge was very light and compact (for its time). Perhaps one could make a 1.25" OD ledge with drilled out inside corners, like on the Fish, and I definitely considered that when I began looking at making a larger lightweight ledge, but there is a better solution, which I will reveal shortly.



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 20, 2017 - 06:03pm PT

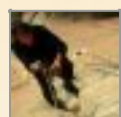
Ok, so time to wrap this up. I'm going live with a Kickstarter in a week or so, and have to get back to that (and build more prototypes!)--our plans are to offer a limited batch of the D4 Portaledge for September delivery. If you or you know anyone who might be in the market for the world's lightest and strongest ledge, please let them know!

Here is the link that will have all current updates: <http://www.facebook.com/bigwallgear/> Please like, follow, and share! (I told you it would be a plug for the D4 portaledge) ;)

The 2017 D4 ledge will have Aluminum tubing. One nice thing about my new design is that it is very adaptable to making a Carbon Fibre version, which I am beginning work on now. But those won't be ready until 2018, and they will be very expensive--at least \$1600. As you can see from the specs posted in these past pages, the carbon fibre will be stiffer, lighter, and stronger. It will save a couple pounds. But expensive. The D4 Aluminium Ledge will be more bomber than anything out there today (stronger, lighter at around 6kg or 7kg, and more rigid) and will retail for \$1200, though the Kickstarter will offer a limited first batch for a much discounted price for the early adopters.

So, the solution to eliminating the spreader bar? Bigger tubing of course, but how?

Innovation #1 of the D4 Portaledge is a Hybrid Diameter design. Think about where the biggest bending stresses and most flex is on a ledge, and it leads to the answer. Back in a few...

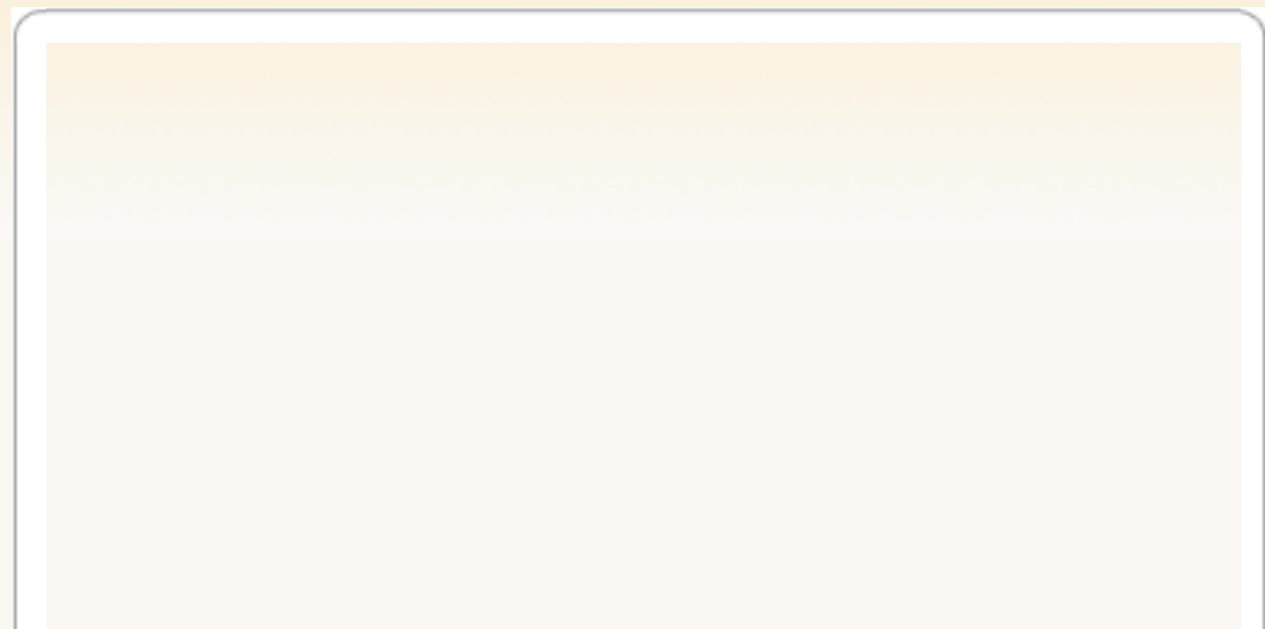


deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 20, 2017 - 07:28pm PT

Ok, here is the solution to eliminating the spreader bar for block corner ledges:





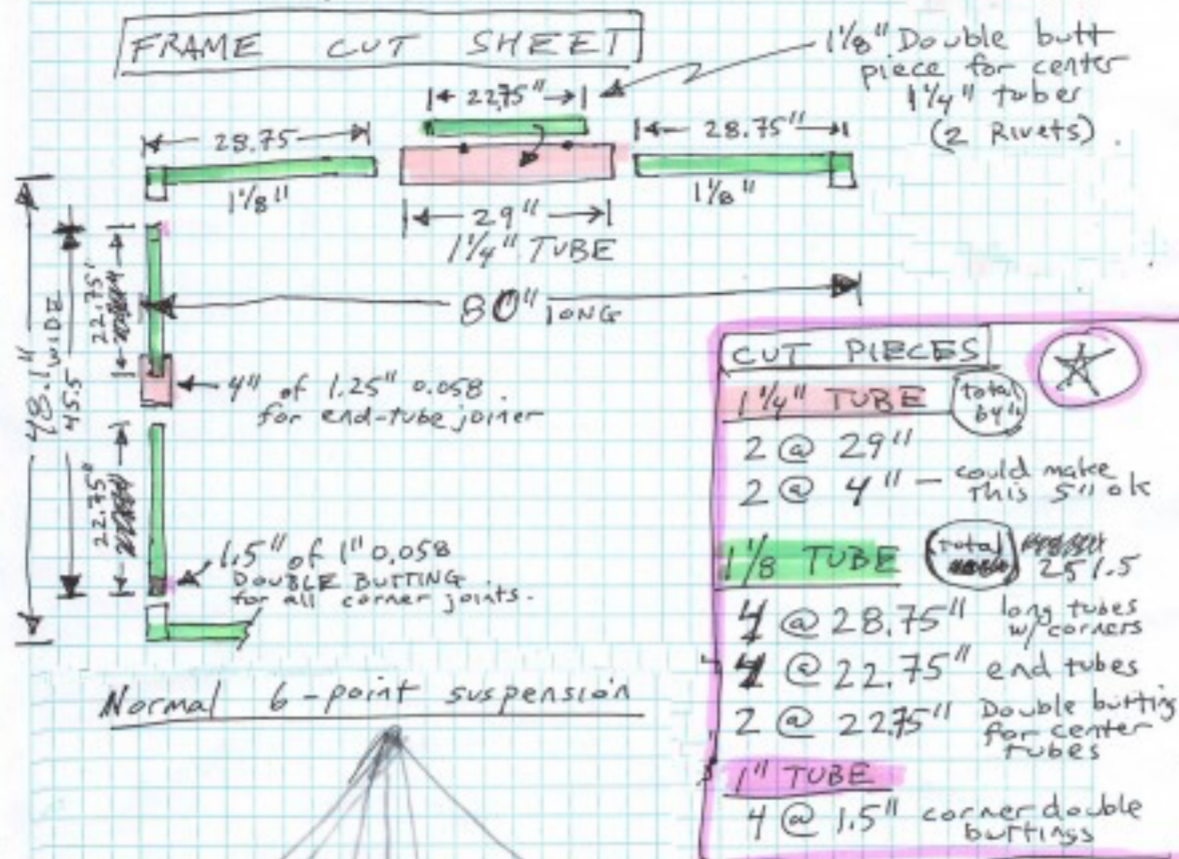
For "Traditional" Block Corner Ledges:

**Hybrid Diameter™ Design**

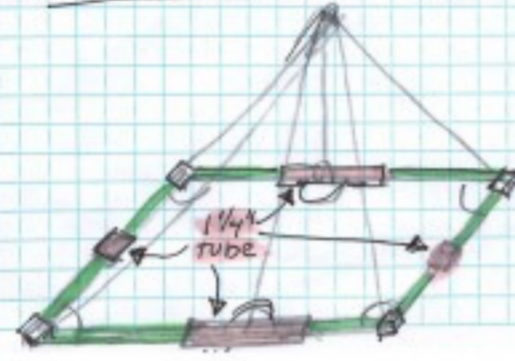
f.i.m.  
Aug 18 2016

TUBING 6061-T6  
- 1" 0.058"  
- 1 1/8" 0.058"  
- 1 1/4" 0.058"

- larger frame (10 piece design)
  - stiffer air side + wall side center poles.
  - Hybrid Diameter Design
- Strong, (light), Stiff, Comfort



Normal 6-point suspension



This hybrid diameter tube design will work with block corner (A5 derivative) portaledge designs, eliminating the need for a spreader bar, as the larger 1.25\"/>

Superior alternative to spreader bars to ensure adequate stiffness for traditional A5 block corner ledge designs (note: this is NOT the D4 design).  
Credit: deuce4

Simply beef up the mid-section of the ledge with the stiffer and larger diameter tubing, while saving weight where the stresses are less on the ends with the smaller diameter tubing. Saves weight on main joiners as well (an important feature of good portaledge design is to ensure the joiner is stronger than the main tubing, otherwise you can get a nasty bend in the joint that renders the ledge unusable).

It might seem like an obvious and simple solution, but I would argue that it came from understanding all the engineering fundamentals, which I hope have explained to everyone in these past posts so they are more easily understood. And I guess it isn't too obvious, or the other manufacturers would have re-engineered their A5 derived designs instead of opting for a spreader bar solution (after all, they've had 20 years to figure this out!).

The Hybrid Diameter design is rigid. Even when set up against a tree, there is almost no flex--as mentioned before, a tree is a very bad loading situation yet I can comfortably say this is really the first portaledge design that is fully suitable for tree camping. Even though I had modelled it extensively with FEA tools before testing a prototype, I had little idea how good it actually is until I actually played with the first pre-prototype last Fall in Yosemite.

Here's a picture of Marek Raganowicz jumping on it at Devil's Elbow. He couldn't believe how light, strong and rigid the frame was! He's heading out with the first D4 prototype to Baffin this week. Note that I have hidden the corners--that is for the next topic which could be called, "Goodbye Block Corners--and Plug for the D4 Portaledge"! ;)



Marek bouncing on D4 ledge frame with almost no flex. Corners are hidden!

Credit: deuce4



This project started thanks to Chris Trull, who approached me in Arapiles last year and quizzed me about portaledge design. His enthusiasm and positive energy really got me excited to put my mind to work on a better portaledge for climbers, after 20 years being away from the portaledge design business (though I have been tinkering with folding tension fabric structures over the years, and hope to bring some of those ideas to light in the coming years).

I feel happy to be able to contribute to climbers again. My design philosophy is that innovation always precedes jumps in human standards (see [Mechanical Advantage](#)), and I hope my new lightweight and compact portaledge design will help more climbers achieve their dreams and extend the limits of human endeavour in the remote big walls of the world.

I appreciate all the input and comments on this post, and again, please help spread the word to anyone looking for a cutting edge tool this year by keeping an eye out for the Kickstarter next week and by staying tuned to the [BigWallGear](#) Facebook page.

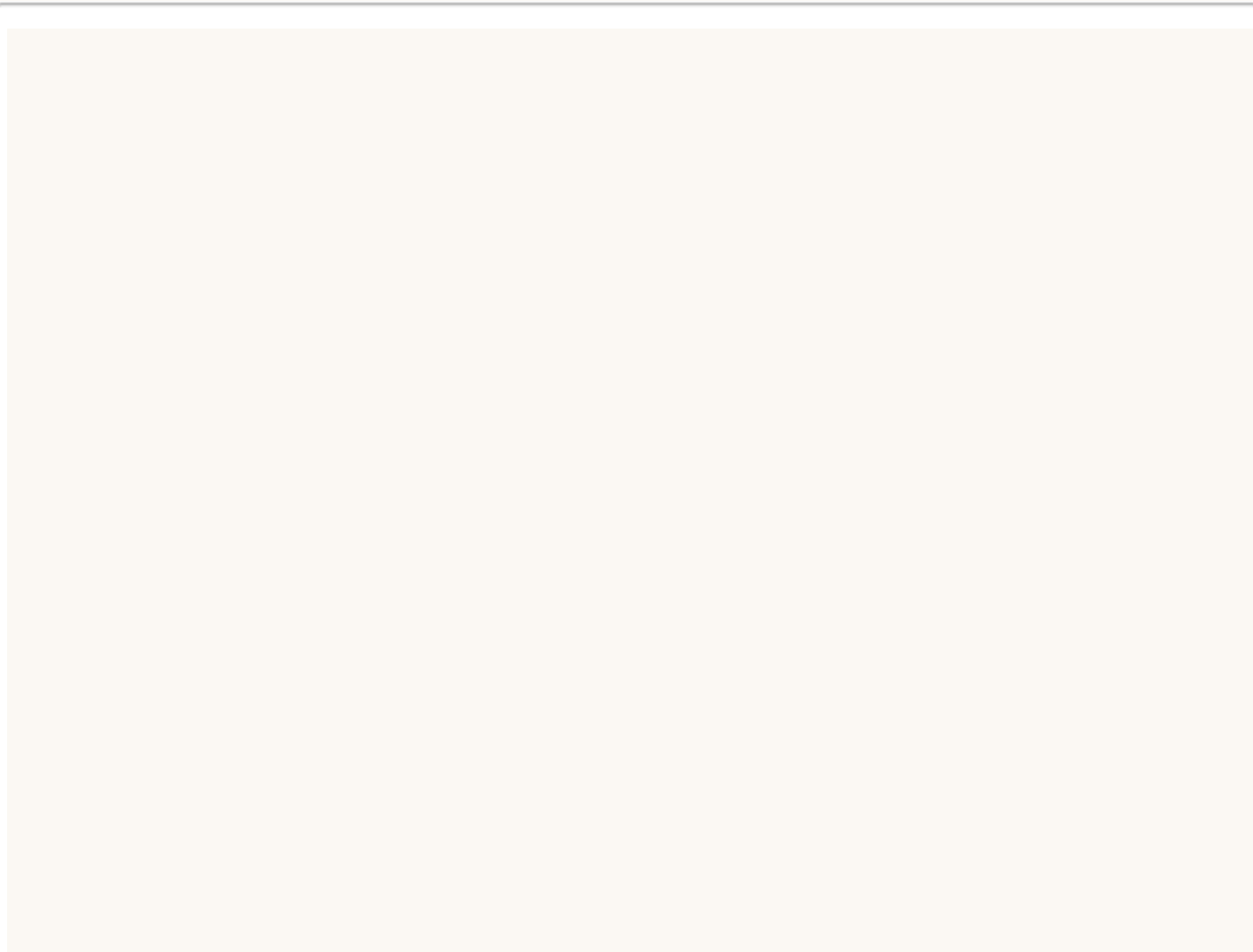
There are four major innovations of the D4 ledge which are completely new, and they will also be disclosed soon. Besides a new corner system, I've come up with a novel suspension system, and also a way to make deployment and pack-up way simpler, quicker, and more organised. More details in the Kickstarter.



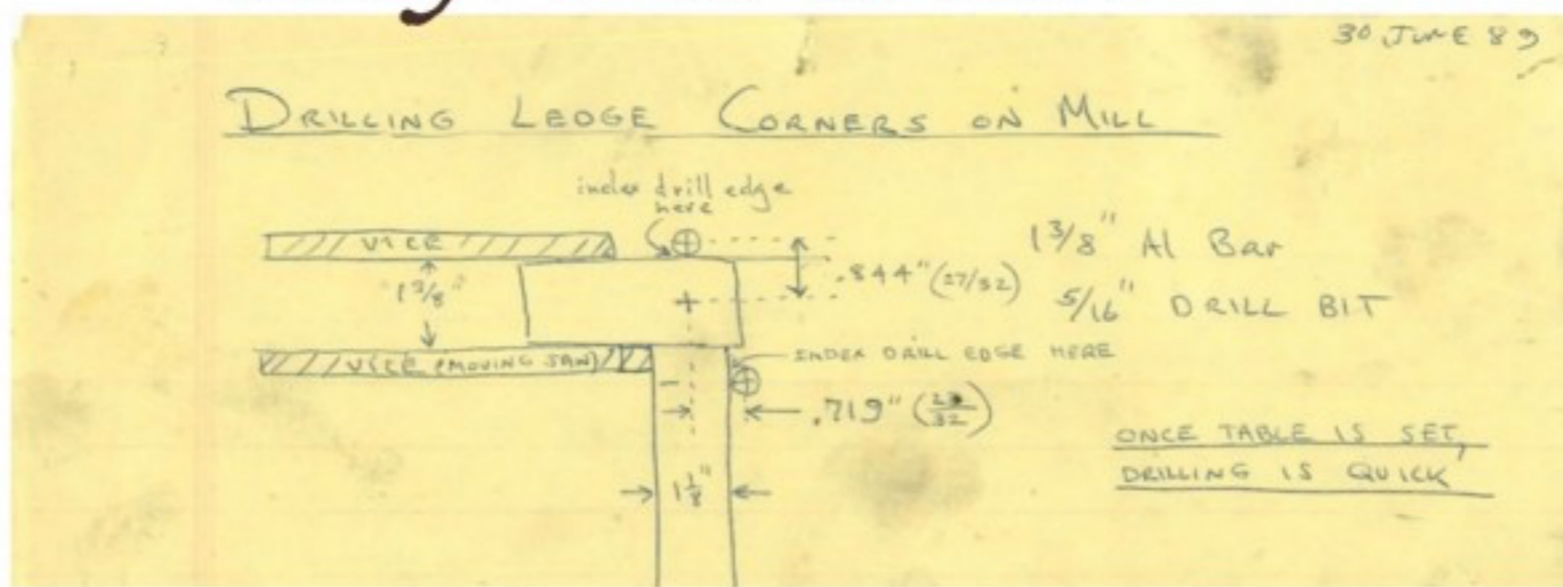
The first D4 ledge, designed by John Middendorf. 6.3kg complete with haulsack, fly pole, and fly.

Credit: deuce4

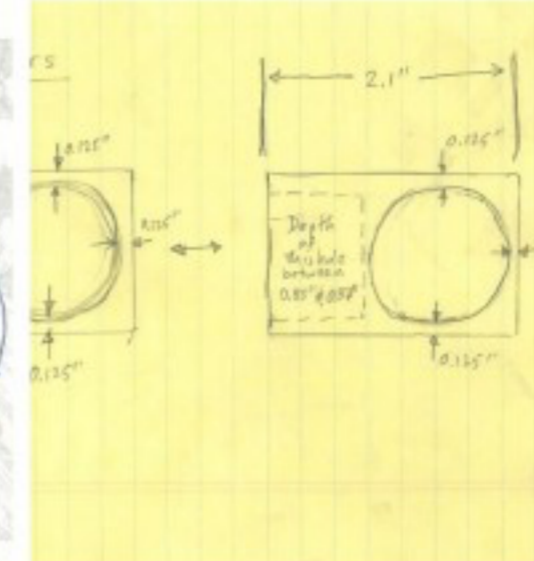
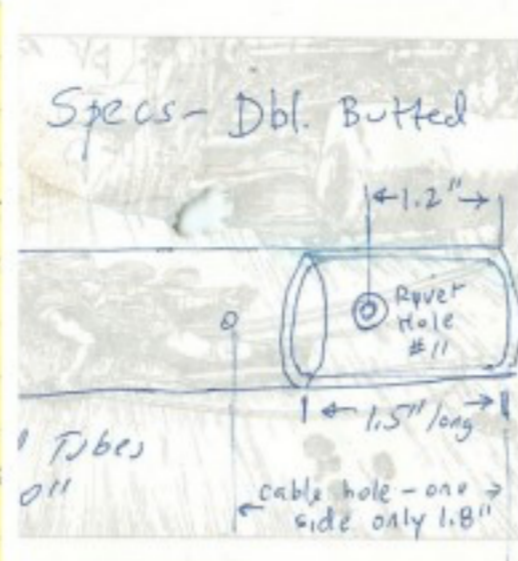
As a last picture, I include this one as a memory to Walt Shipley, who helped with the initial design of the A5 portaledge. The top drawing is Walt's:



# Goodbye Block corners!

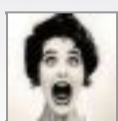


Making Corners  
 Cut stock to 2.1"  
 Sand off burrs.  
 Stamp AS - mark for the  
 Mill Thru hole - 1/8"  
 Mill 0.85" depth hole  
 Ream 0.85" depth hole  
 Sand off corners.  
~~Chamfer~~ 0.85" depth hole  
 Polish.



Goodbye Block Corners! Say, Donna Know You?

Credit: deuce4



**Moof**

Big Wall climber  
 Orygun

Feb 20, 2017 - 08:07pm PT

Exciting! Know anywhere I can sell some plasma to?



**edavidso**

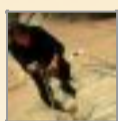
Trad climber  
 Oakland, CA

Feb 20, 2017 - 08:22pm PT

John, good idea with the hybrid diameter. For a simply supported beam with distributed load, moment and deflection increase non-linearly towards the center so it makes sense to have a larger diameter tube at the center and then step it down to the smallest diameter at the attachment points. I guess the easiest way to do this would be telescoping tubes? I also thought of hydroforming to produce a continuous expanding diameter tube but it would be expensive for small volumes.

Your flex index is the inverse of the stiffness formula I posted earlier,  $k$  is proportional to  $E \cdot d^3 \cdot t / l^3$ . The only difference is that I'm using a thin wall approximation.

Looking forward to the other innovations!



**deuce4**

climber  
 Hobart, Australia

Topic Author's Reply - Feb 20, 2017 - 09:31pm PT

No, Hybrid Diameter simply refers a combo of commonly available tubing diameters in the same ledge (specifically, with larger diameter tubing where the bending stresses and flex is the greatest, in the middle of each side). Cost efficient as well as light and strong and rigid.



**Riley McDonald**

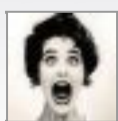
climber  
 CA

Feb 20, 2017 - 10:09pm PT

I have been loving the suspense of reading this... Thanks John!

I think I figured out your joint idea. Without giving too much away, am I right in saying that corners and joints don't necessarily have to be the same? Would make sense also for connections of differing OD tube.

Edit: I think I just saw video proof! Those who want the source can probably find it with some sleuthing... Or wait...



**Moof**

Big Wall climber  
 Orygun

Feb 21, 2017 - 12:18am PT

So the curvy looking corners aren't just my imagination?



**BLUEBLOCR**

Social climber  
 joshua tree

Feb 21, 2017 - 09:31am PT

For you tech guys here's a great look into the science of folding.

[Click to View YouTube Video]

Could this technique be in the future for ledge beds? ;)



**'Pass the Pitons' Pete**

Feb 21, 2017 - 10:19am PT

Hee hee hee. Deucey is really milking the suspense, isn't he??

Wait'll you guys see this thang. John is doing a brand new thang!



Big Wall climber  
like Ontario,  
Canada, eh?

And the photo above with Marek, showing the structural rigidity of the hybrid tube design [brilliant!] but with the corners STILL hidden – is fabulous.

C'mon, guys – try to guess! What has Deucey done with the corners. He has hinted above by saying repeatedly, "good bye to block corners". Can anyone guess?

NOTE: No fair guessing if you have already seen his spoiler video posted elsewhere, because you know the secret!

The charts and graphs are pretty cool, but still a little too complex for this professional engineer. Certainly the easiest to understand is that flex varies by the cube of the tube length, which explains why the Metolius design is so "flexy".

But putting bigger tubes in the middle bits of the four sides makes perfect sense.



**Tom**

Big Wall climber  
San Luis Obispo CA

Feb 21, 2017 – 12:44pm PT

Be sure to tie your D4 down.

A big ledge is like a kite . . . or a hang-glider.

[Wind gusts of 199 MPH in parts of the High Sierra – SFGate](#)

I found out, the hard way, that I needed to put short pieces of steel tubing both inside and outside at the ends of my carbon fiber tubes, especially if I was going to flag the ledge above a haul bag. Otherwise, the tubing would split and delaminate like crazy. The extra weight of the reinforcement doesn't seem to be that big of a deal.

For my homemade ledge, I made corner blocks with stubby plugs, similar to what FISH uses, instead of blocks with holes. This made the blocks a little lighter, because my carbon fiber tubing is rather large, at 1.18" OD.

I sawed 1" aluminum plate into an L-shape, and then use a hole saw to form the cylindrical plugs. A hand saw was used to clean off the small amount of corner scrap.

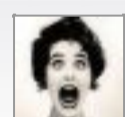
For the tubing connections at the center of the long sides, I used external sliding steel tubes. When assembling the ledge, everything goes together easily, until the last long side connection. I butt the two tubes together at the angle, and then toggle them into alignment, and slide the steel tube over the joint. This allows for a tight bed, without tensioning straps, and is pretty fast to assemble and take down. PTPP timed me in October at something like 90 seconds to take the ledge down, fold it, and wrap the straps around, ready for the haul bag.

I use duct tape (what else?) to limit how far the steel tube can slide one way or the other. The suspension straps cinch on the carbon tubing right there, and prevent the steel tube from sliding off of the butt joint.

I am not going to talk about how I dealt with an A5 Expedition Fly that was just THAT much too small for my ledge to fit inside. I will only mention that Wino Tower is a very classic spot to get stuck in the rain for an extended stay, and not just because the roof runoff from above hits right there.

I will cut my long ledge tubes down about 1 inch each, and then my ledge will fit inside the A5 Expedition Fly.

How do you get rid of the weird smell of the waterproof coating on the inside of the yellow fabric? Can I use aerosol urethane wood varnish? Or will that become brittle and crack?



**Moof**

Big Wall climber  
Orygun

Feb 21, 2017 – 12:58pm PT

So pre-bent radiused aluminum elbows? Where can I find the leaked video? Round corners would be nice, curious how well it would all pack up.

Not sure where I can scrape up 1.2k, might have to wait till after the fence gets redone, and the house gets painted. Ugh. Growing up sucks.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply – Feb 21, 2017 – 01:57pm PT

We've set a date for the Kickstarter--March 1--thinking of selling three ledges at cost, \$450 off retail, so get in early!

Edit: early adopter discount is \$450.



**ecdh**

climber  
the east

Feb 21, 2017 – 02:36pm PT

the algorithms are all way over my head but i get what loosing 5kg means and no extra last step hanging in space forcing a spreader bar by torch light, so boom, im in.

deuce, what can we hear about the fly? winter exped style? did you put the little window somewhere it can be looked thru when sitting? venting? weight?  
will a BD fly fit if not?

and if i drop by tasmania can i score a peek?



**Batrock**

Trad climber  
Burbank

Feb 21, 2017 – 04:20pm PT

I'll be on Kickstarter ready to push the button on March 1st

Feb 21, 2017 – 04:56pm PT



'Pass the Pitons' Pete

Big Wall climber like Ontario, Canada, eh?

"As long as you've got the curves, baby, I've got the angles...."

Wolfman Jack on Clap for the Wolfman by The Guess Who

[Click to View Linked Image]

John's going to be live on Tasmanian radio "tonight" [for us] at around 730pm Pacific time for us. I'll try to find a link, would be fun to listen.



the Fet

climber Tu-Tok-A-Nu-La

Feb 21, 2017 - 05:01pm PT

6.3kg. Impressive!!



Moof

Big Wall climber Orygun

Feb 21, 2017 - 07:19pm PT

Out of curiosity, what is the back story on the Tasmania move? Cheap early retirement, adventure, something else?



Tom

Big Wall climber San Luis Obispo CA

Feb 21, 2017 - 08:46pm PT

*Will the fly be a winter exped style?*

PTPP and Anita used the D4 fly last October on New Dawn to Dawn Wall. We climbed into two moderate rain storms on that climb: two days and nights on Lay Lady Ledge, and three days and nights on Wino Tower. Ryan used the A5 expedition fly for his FISH double ledge. Setting up Ryan's ledge and fly before the storm rolled in was NBD, but in a crisis situation, that setup could lead to an epic tale of pure misery.

Pete's well-seasoned appraisal on that wall was that the regular fly for the D4, with no floor, made more sense than having to get an assembled portaledge inside a tent-like Expedition fly. For one thing, you can always hang the ledge from the fly, with it still furled in the bag, and rapidly unfurl it if it starts raining (furl it accordion-style, eh?). Also, the Expedition fly's blue bottom tends to collect water below the ledge, and sometimes it's necessary to poke extra holes in the fabric to drain the water. Therma-Rest pads, or similar, offer pretty good insulation, and judicious use of sleeping bags can seal off the holes in the bed at the corners and where the side straps connect on the long sides. A better solution might be to have velco-capable flaps that seal off the bed completely.

Pete said that the D4 fly, with no bottom, was absolutely The Better Way, and was The Best he'd ever slept under on a big wall.

I might cut the blue bottom off of my A5 Expedition Fly to derate it, but to also make it more like the D4 fly.

One thing that spooked me on that wall, was use of a camp stove, even for short times, under a rainfly. Carbon monoxide has very high affinity for the blood's hemoglobin; *carbon monoxide is approximately 230 times stronger than the affinity between hemoglobin and oxygen*. So, even a small amount of CO can rapidly tie up the blood's oxygen transport mechanism, and lead to headache, fatigue, or worse.

[https://en.wikipedia.org/wiki/Carbon\\_monoxide\\_poisoning](https://en.wikipedia.org/wiki/Carbon_monoxide_poisoning)

What about a nomex-type fabric heat-resistant hood, sleeve, port and bonnet near the apex of a rainfly, to provide an effective chimney to vent combustion byproducts from a stove? If you're going to go large on the Big Wall, you might as well go *Yuge, Let Me Tell You*.

On that Big Wall, the D4 was typically not flagged above a haul bag. The FISH, with its spring-steel frame was the preferred belay ledge, and it is capable being pulled up against obstacles, twist into a pretzel, and then magically spring back when it finally pops loose. An aluminum frame may not have the same resiliency. Also, the large size of the D4 may further impair its suitability for flagging above a haul bag.

With respect to this thread, and similar zeitgeisten about improving the state of the art, just remember:

*The only thing worse than trying new things, and potentially not getting it right the first time, is doing the same old thing, over and over and over.*

*Doing the same thing, over and over and over, and expecting a different result, is the very definition of "crazy".*

■ Albert Einstein



deuce4

Topic Author's Reply - Feb 21, 2017 - 09:43pm PT

Tom, actually that was not a D4 ledge you guys had up there, though it was a frame of my design with the traditional block corners.



climber  
Hobart, Australia

The first D4 was still being built when you were up there--see the photo of Werner's shop earlier in this thread--that yellow ledge in the background was the first pre-prototype D4.

Edit: all good, Tom! Keep up the good ideas! Cheers



**Tom**

Big Wall climber  
San Luis Obispo CA

Feb 21, 2017 - 11:31pm PT

^^^^^^

I'm sorry I mixed up things.

I was an observer to the D4 ledge experience of others, and not an active user thereof.

PTPP raved, all the way up the Big Wall, about your ledge.

I wanted to impress that positive energy that was expressed about its superiority.

As a mechanical engineer, myself, I wanted to also bring forth an objective evaluation - and not a condemnation - in order to hasten the advance of the state of the art.

You, John, are the King Of The Portaledge Paradigm.

My intent is furtherance, not hinderance, nor idle criticism.



**John Mac**

Trad climber  
Breckenridge, CO

Feb 22, 2017 - 06:53am PT

Great stuff. The suspense is killing me!



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Feb 22, 2017 - 09:16am PT

Voice of Dr. Evil: "Someone throw me a frickin bone"

All right, Johnny.....

...Throw 'em out Innovation #2.

;) )

P.S. I see you pulled down "Mini Me"

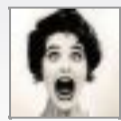


**Mungeclimber**

Trad climber  
Nothing creative to say

Feb 22, 2017 - 09:35am PT

Please include a kg to lbs conversion chart. ;)



**Moof**

Big Wall climber  
Orygun

Feb 22, 2017 - 09:52am PT

6.3 kg = 1.0 stone.

So if I am following correctly we have hybrid poles with varying diameter and strategic double butting (though not exactly as shown in the corner block drawing). Lighter, stiffer, no spreader bar.

We also are in for curved corners that become part of the stiffness of the frames (more than receptacles for the poles). It sounds like there may be more than meets the eye here? Duece seems coy...

The suspension is 4-point, which probably cut out a good 1/3-1/2 kg or so?

The fly looks to have a frog-eye vent, which would be a nice addition on its own. Fly looks to have some buckles on the bottom to solidly lash it to the bed, hopefully these can be attached and adjusted while inside the ledge?

Without a good view of the floor, it looks like there are no groin level cutouts. I have to admit that I've taken advantage of such conveniences in my Econledge many times for late night relief. So a piss bottle will be necessary even for the outside guy. No biggie.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 22, 2017 - 10:24am PT

Love all the sleuthing, hope it inspires more design innovation.

Really gotta focus on building the next prototypes and to get a bit more fit so I can test Prototype #2 in Mt. Buffalo soon, and of course the details for the Kickstarter next week, so I don't think I will have time to discuss the technical details of the other new aspects.

But there's an article out there with a photo...

(Oh, what the heck--here ya go: <http://www.businessinsider.com.au/the-secret-to-conquering-the-toughest-climb-in-the-himalayas-may-lie-in-a-shed-in-tasmania-2017-2> )

Please support the Kickstarter if you can, March 1 (might be Feb 28 in USA). My wife is helping with the swag/perks, I am just focused on making sure the first batch of 28 (plus a few more protos) is the best we can make them.

Feb 22, 2017 - 10:58am PT

I just got the D4 Proto #1



**Regan**

Big Wall climber  
Poland/Scotland



D4 Proto #1

Credit: Regan

Thanks Deuce  
The first test in the next week.  
Yeehaw!



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 22, 2017 - 11:06am PT

Yippee!



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Feb 22, 2017 - 11:19am PT

Send it Marek! What feature are you climbing? Will you be in Sam Ford Fjord?

Only 400 nights, Deucey?

Punter. ;)



**Regan**

Big Wall climber  
Poland/Scotland

Feb 22, 2017 - 11:59am PT

We are going on the East Coast with open minds, so we will see what will happen...



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Feb 22, 2017 - 12:11pm PT

"We"?? With a partner??

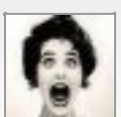


**Regan**

Big Wall climber  
Poland/Scotland

Feb 22, 2017 - 12:14pm PT

Yes, I am going with Yeti, than...  
Do not ask too many questions...:)



**Moof**

Big Wall climber  
Orygun

Feb 22, 2017 - 12:57pm PT

Thanks for the link Deuce. I'm modestly fearful of what I see on the bed tensioning straps. Without a better picture I am going to probably embarrass myself, but I am an embarrassment on a good day anyway...





Missing photo ID#491077

If the plan is to use the same ~400D pack cloth equivalent as A5 ledges of yore, the horizontal webbing strip (similar from what I can see to Metolius design) where the strap attaches to the bed makes for really crappy load spreading, resulting in very high stress in the bed material. A few of moderately aged A5 ledges had floor blowouts when people put a knee either at corners, or at the reinforcing triangles (high stress at an existing stress riser).

Metolius uses some horrendously thick overkill bed material, so their crappy load spreading can get away with murder. But I've always hated Metolius' overkill for overkill's sake approach to material selection.

You have to get the reinforcing fibers to be at a diagonal angle to the bed fibers. So V's of webbing at each attachment point will spread the stress out vastly better than any amount of horizontal webbing ever can. A wide webbing reinforcement just shuffles the stress down a couple inches.

End rant. Hopefully I am just not able to see the details.



**John Mac**

Trad climber  
Breckenridge, CO

Feb 22, 2017 - 01:20pm PT

Great article.



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Feb 22, 2017 - 01:23pm PT

Surely you can't imagine the Dyn-amic Deucey to use mere pack cloth on the bed. Ee-ven a man like John could choose a better ma-terial.



**Moof**

Big Wall climber  
Orygun

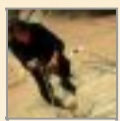
Feb 22, 2017 - 01:34pm PT

Pack cloth, or a similar weight ripstop is plenty strong, but you do need to avoid major stress risers. Russ has been doing pack cloth beads for ages without issue, but he has no tension straps to create stress risers. The 3 yards of material in a ledge makes it a large hitter to total weight, so just using extra thick stuff is a poor engineering solution.

Are we going to find out that Kevlar fabric is on the menu now too? Is that Keprotect (weave looks closer to Keprotect than pack cloth)? I'm dying here.

How about money-print 1000D Polyester Cordura for a really "classy" ledge?

<http://www.rockywoods.com/Fabrics-Kits/Heavyweight-Polyester-Fabrics/1000-Denier-Coated-CORDURA-HP-Polyester-Fabric-US-Money>



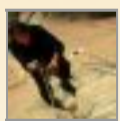
**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 22, 2017 - 03:07pm PT

Talk about wordplay, Pete!

Hey Moof, can you send me an email at john at bigwalls.net We've already changed the bed tensioner system and wouldn't mind further discussion offline, as those details are still in flux...



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 22, 2017 - 03:32pm PT

Thanks Moof!

Hey Fet!

*Future SuperTopo climbing news email entry for sure!*

Looks like we didn't make it...

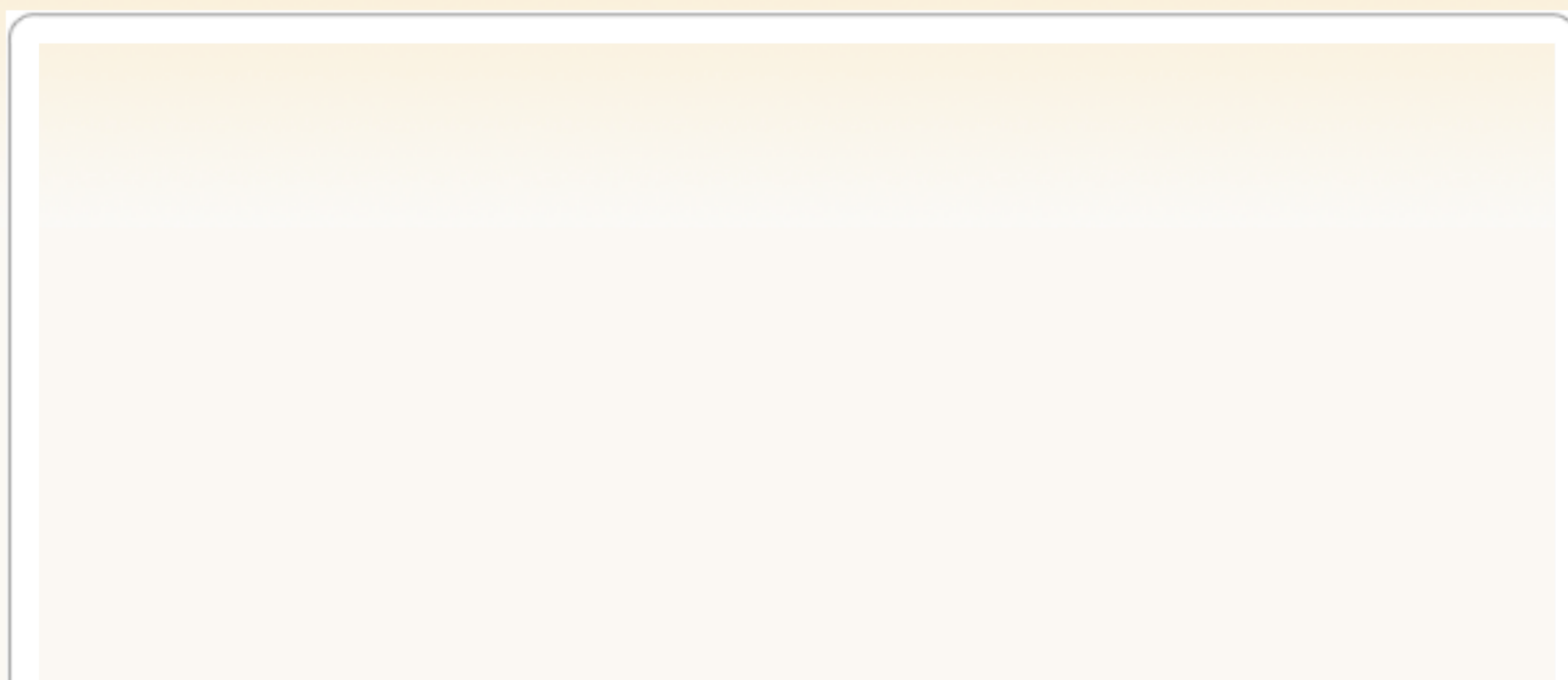


**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 22, 2017 - 03:33pm PT

I'm finding that I am referencing this page for my own work now, so here are the key charts in one post:



Portaledge Material Properties

Material	Y Yield Strength (KSI)	Ultimate Strength (KSI)	E Modulus of Elasticity (KSI)	Density (lbs/in <sup>3</sup> )	Source
6061-T6 Aluminum	40.0	45.0	10000	0.098	<a href="http://www.matweb.com/search/DataSheet.aspx?MatGUID=b8d536e0b9b54bd7b69e4124d8f1d20a">http://www.matweb.com/search/DataSheet.aspx?MatGUID=b8d536e0b9b54bd7b69e4124d8f1d20a</a>
7075-T6 Aluminum	73.0	83.0	10400	0.102	<a href="http://www.matweb.com/search/DataSheet.aspx?MatGUID=4f19a42be94546b686bbf43f79c51b7d">http://www.matweb.com/search/DataSheet.aspx?MatGUID=4f19a42be94546b686bbf43f79c51b7d</a>
4130 Cro-Mo Steel	63.1	97.2	29700	0.284	<a href="http://www.matweb.com/search/DataSheet.aspx?MatGUID=e1cceb90c94502b35c2a4745f63593">http://www.matweb.com/search/DataSheet.aspx?MatGUID=e1cceb90c94502b35c2a4745f63593</a>
Titanium 3-2.5	76.9	89.9	14500	0.162	<a href="http://www.matweb.com/search/DataSheet.aspx?MatGUID=2710548c162947fb90d7199aaa24226f">http://www.matweb.com/search/DataSheet.aspx?MatGUID=2710548c162947fb90d7199aaa24226f</a>
Titanium 6-4	128.0	138.0	16510	0.160	<a href="http://www.matweb.com/search/DataSheet.aspx?MatGUID=a0655d261898456b958e5f825ae85390">http://www.matweb.com/search/DataSheet.aspx?MatGUID=a0655d261898456b958e5f825ae85390</a>
Carbon Fibre LowM		200	15000	0.056	various
Carbon Fibre HighM		160	30000	0.057	various

Typical Portaledge Tubing Material Properties

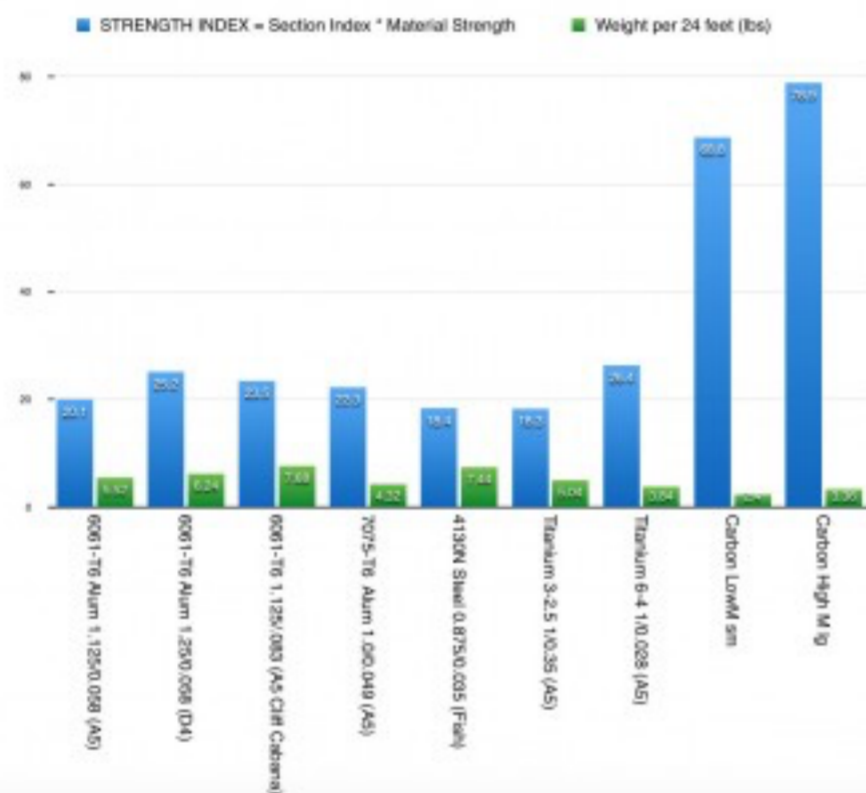
Credit: deuce4

Design Details--Portaledge Strength Index

$$StrengthIndex = \left( \frac{OD^4 - ID^4}{OD} \right) \sigma$$

Strength Index Chart for Typical Portaledge Frame Materials

TUBING	OD	wall	ID	Material Strength (KSI)	Section Index (OD <sup>4</sup> - ID <sup>4</sup> )/OD	STRENGTH INDEX = Section Index * Material Strength	Density lbs/in <sup>3</sup>	Weight per foot (lbs)	Weight per 24 feet (lbs)	Strength/Weight INDEX
6061-T6 Alum 1.125x0.058 (A5)	1.125	0.058	1.009	40	0.5025	20.1	0.098	0.23	5.52	3.6
6061-T6 Alum 1.25x0.058 (D4)	1.25	0.058	1.134	40	0.6302	25.2	0.098	0.26	6.24	4
6061-T6 1.125x.083 (A5 CHH Cabana)	1.125	0.083	0.959	35	0.672	23.5	0.098	0.32	7.68	3.1
7075-T6 Alum 1.0x0.049 (A5)	1	0.049	0.902	66	0.338	22.3	0.102	0.18	4.32	5.2
4130N Steel 0.875x0.035 (Fish)	0.875	0.035	0.805	97	0.19	18.4	0.284	0.31	7.44	2.5
Titanium 3-2.5 1.0x.35 (A5)	1	0.035	0.93	72.5	0.2519	18.3	0.162	0.21	5.04	3.6
Titanium 6-4 1.0x.028 (A5)	1	0.028	0.944	128	0.2059	26.4	0.160	0.16	3.84	6.9
Carbon LowM sm	1	0.05	0.9	200	0.3439	68.8	0.056	0.1	2.4	28.7
Carbon High M lg	1.1	0.065	0.97	150	0.5262	78.9	0.057	0.14	3.36	23.5



Middendorf's Portaledge Strength Index

Credit: deuce4



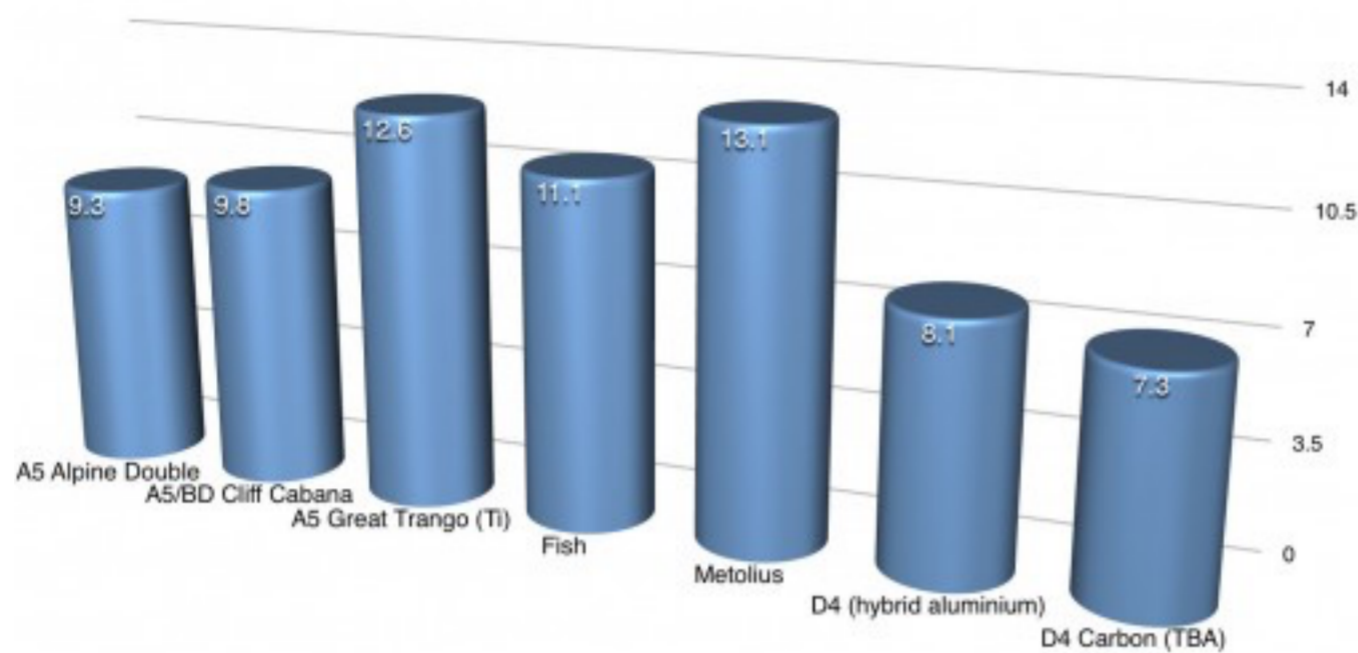
# Design Details--Portaledge Flex Index

$$FlexIndex = \frac{L^3}{E * (OD^4 - ID^4)}$$

Flex Index for Double Portaledges (lower numbers are better)

	OD	Wall	ID	Length	L/2	Material E	FLEX INDEX
A5 Alpine Double	1.125	0.058	1.009	75	37.5	10000	9.3
A5/BD Cliff Cabana	1.125	0.083	0.959	84	42	10000	9.8
A5 Great Trango (Ti)	1.00	0.035	0.93	75	37.5	16510	12.6
Fish	0.875	0.035	0.805	76	38	29700	11.1
Metolius	1.125	0.058	1.009	84	42	10000	13.1
D4 (hybrid aluminium)	1.25	0.058	1.134	80	40	10000	8.1
D4 Carbon (TBA)	1.10	0.065	0.97	80	40	15000	7.3

Flex Index for Portaledges (lower numbers are better—less flex)



Middendorf's Portaledge Flex Index for typical portaledge materials

Credit: deuce4



**WBraun**

climber

Feb 22, 2017 - 03:38pm PT

John

You should make a WalMart version.

They'll be cheap consumer version for the American back yard hammock to put beer drinking lunker into after he mows the lawn.

They'll sell em in Home Depot too.

\$50 and you'll sell millions .....



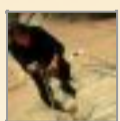
**Chris McNamara**

SuperTopo staff member



Feb 22, 2017 - 03:51pm PT

VERY excited to see this. I have always been a huge fan of your work, John.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 22, 2017 - 04:53pm PT

Thank you Chris! So appreciate your inspiration and of course your great forum over the years!

Cheers



**max kruzic**

Big Wall climber  
Bishop, CA

Feb 22, 2017 - 07:27pm PT

Any general timeline for release? Sorry if this has already been answered in previous thread comments. In the market for a new double and would like to hold out to see your design if timing allows.



**Myles Moser**

climber  
Lone Pine, Ca

Feb 22, 2017 - 07:36pm PT

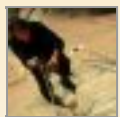
John design around the cosnept of the Jannu rainfly. Never has let us down



**SalNichols**

Feb 22, 2017 - 07:39pm PT

Don't forget about electrical conductivity and galvanic corrosion problems between CF and aluminum or stainless steel...or any other kind of steel for that matter.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 22, 2017 - 08:31pm PT

Sign up here to get updates for the upcoming D4 Portaledge Kickstarter:  
<http://eepurl.com/cDn3kT>



**Moof**

Big Wall climber  
Orygun

Feb 22, 2017 - 09:01pm PT

Current portaledge? Hard to answer when you have a stable of 5 jalopies of varying parentage.



**BLUEBLOCR**

Social climber  
joshua tree

Feb 23, 2017 - 08:57am PT

bed bug bump



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Feb 23, 2017 - 09:17am PT

The bed clue is in my post above. Did everyone [except Deucey] miss it?!



**Moof**

Big Wall climber  
Orygun

Feb 23, 2017 - 09:36am PT

Just thought you were drunk typing again. So Dyn-ee-ma material? Ripstop reinforcement I assume? Years back I got some great 500D material with Dyneema ripstop in it, very low stretch, burly, and just enough texture to not be too damn slippy. Can't find it anymore, sadly.

You can still get 400D diamond ripstop, but as best I can tell it is really just decorative and not and not very rip-stopping, and not less stretchy than pack cloth.

Looking forward to hearing the details of whatever wonder material John scared up. Negotiations with the spouse about getting portaledge #6 is going about as well as I expected. Might have to sit this one our for a year or two.

Edit 1:

So maybe like this 210D stuff? Maybe you found a ~400D version of it I hope?



Missing photo ID#491175

Edit 2:

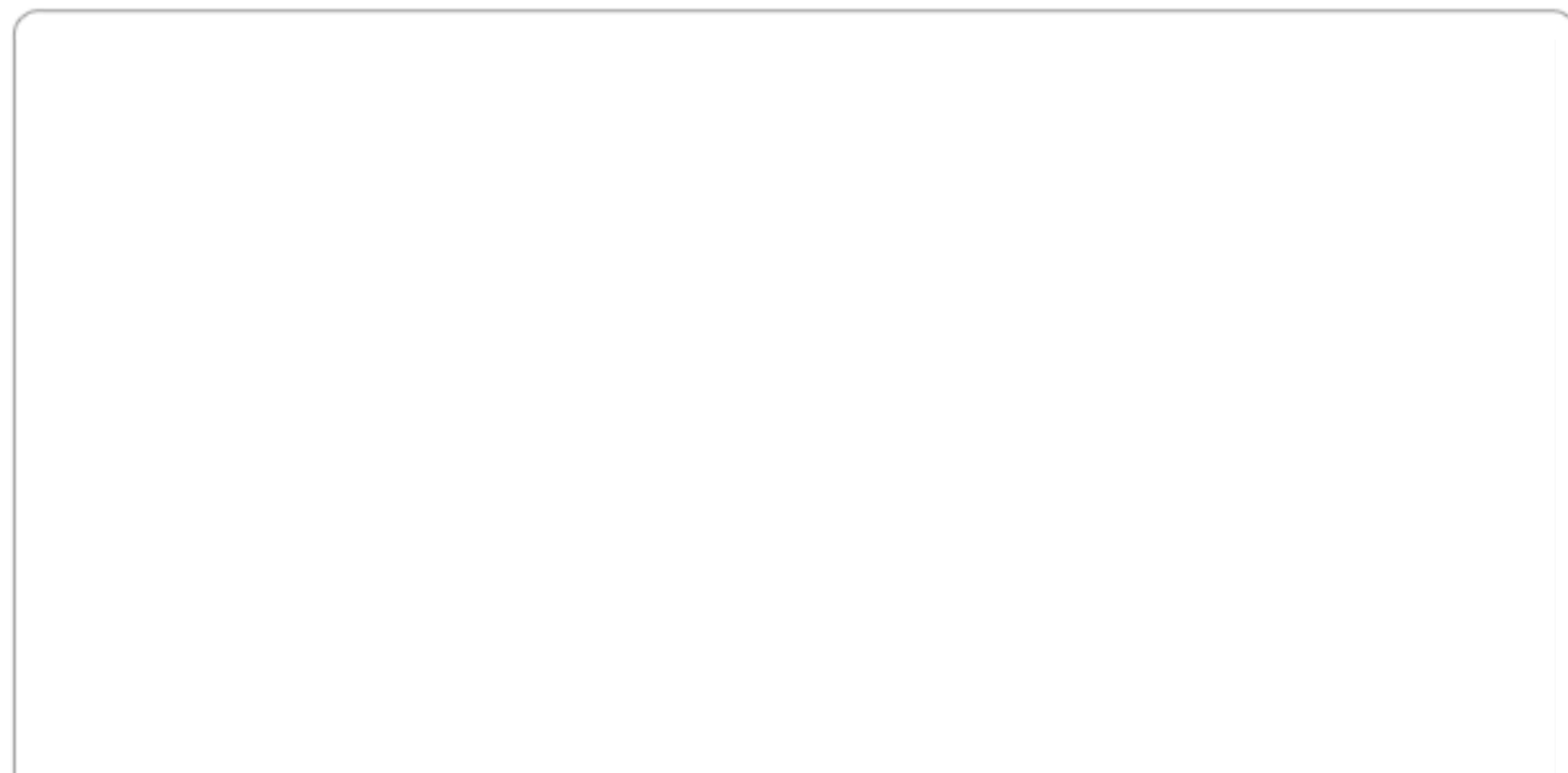
Pattern looks more like this ROBIC stuff, which is not Dyneema from what I can tell. Still looks like good stuff:



Missing photo ID#491176

Edit 3:

Here is Regan's photo side by side, seems similar in weave.







D4 Proto #1

Credit: Regan



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Feb 23, 2017 - 12:00pm PT

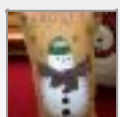
Materials are in flux, these are prototypes, after all. Next protos will be ready for action soon, one for my big wall revival next week on Mt Buffalo.

Here ya go, sleuths!



D4's Ready for frames...

Credit: deuce4



Big Mike

Trad climber  
BC

Feb 23, 2017 - 12:50pm PT

Hi John,

I'm following this with great interest! I have always been interested in picking up one of your old A5 singles because it was long enough to fit my 6'8 frame.

Will the D4 fit me? Or am I going to need a custom ledge??

Thanks for revolutionizing the industry! Again!!



BLUEBLOCR

Social climber  
joshua tree

Feb 23, 2017 - 01:58pm PT

Looks as tho a 4-1 suspension with nylon fins connecting to the bed. With an extra center fin to possibly reduce spreadage?

Do I win a sticker 😊

Looks bitchin,btw!

Feb 23, 2017 - 02:22pm PT



^^ Ka-ching! Blue gets a gold star.



'Pass the Pitons' Pete

Big Wall climber like Ontario, Canada, eh?



Moof

Big Wall climber Orygun

Feb 23, 2017 - 05:07pm PT

In my Portaledge Fails collection is a Ferrino brand monstrosity, basically a bad A5 knockoff that uses extra thick fabric in weird places, and wimpy plastic buckles (one failed one which made the original owner want to part with it for a song, and now it lives in my basement). It is heavy as can be, with the stupidest haulbag conceivable. Plenty to ridicule, not limited to a 5 buckle center fin!?!?

BUT, it does have a design tweak I think is worth considering.



Ferrino ledge

Credit: Moof



Ferrino bottom

Credit: Moof

Notice anything upside down and backwards? The buckle for the bed tensioner is on the bottom, AND is on the ledge floor instead of on the ends of the bed (strap sticks out of ends of the bed). Why do I like this?

- 1) Smooth floor, no straps and buckles under your head.
- 2) With the positions of the buckle and the strap swapped you tension by pulling the strap away from the ledge instead of awkwardly away from you towards the center as the A5 and pictured D4 prototype do. So you can brace one hand on the ledge frame while yarding the bed tight.



Their updated one has a laughable take on the spreader bar... FAIL.



Missing photo ID#491241



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 23, 2017 - 09:26pm PT

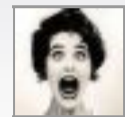
^^^^^

Is that a joke?

You should hacksaw the extra length of the corner eyebolt--that will get caught on things for sure. Then a quick file job.

Oh my.

Ps--we tried underneath buckles back in A5 days, but a few of us didn't like it in actual in-field use, as it is harder to re-tension as might be convenient from time to time. So we went back to on top tensioners.



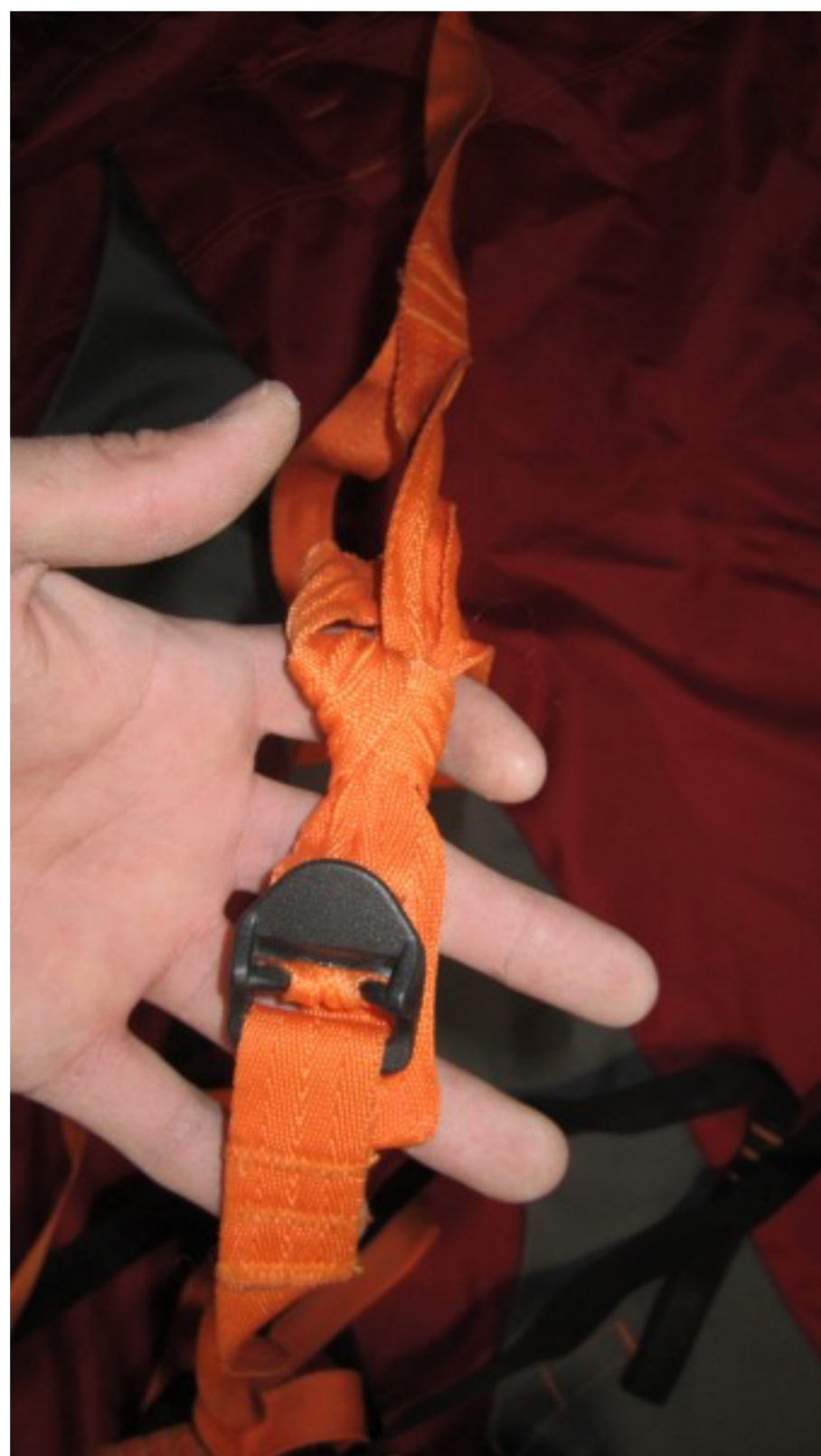
**Moof**

Big Wall climber  
Orygun

Feb 23, 2017 - 09:44pm PT

Euros man. Euros.

More of the atrocity:

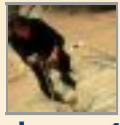


Crappy buckle

Credit: Moof



Thanks for the background on the buckle location, I've never lived with the downsides. Makes sense.



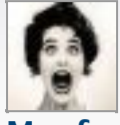
**deuce4**

climber  
Hobart, Australia

Topic Author's Reply – Feb 23, 2017 – 09:46pm PT

ΛΛΛΛΛΛ

Don't show that stuff to me, it makes me cry when I think of poor souls actually using that on a wall.



**Moof**

Big Wall climber  
Orygun

Feb 23, 2017 – 10:04pm PT

The knotted webbing and 2 failed buckles tells an epic bad night of horrors someone endured. I think I paid \$300 or so, and in retrospect I probably got ripped off almost as bad as the original owner. But who doesn't need third expedition fly in their collection I figured? I need to fix up the suspension and pass it along to the next sucker.

The haulbag (haulBAD perhaps?) is garbage can sized. As best I can tell the intent was to just shove the fly in next to the ledge, and hope you didn't drop it while fishing out the ledge itself on fair weather nights. Vinyl reinforcement is on the INSIDE of the haulbag. WTF?!? Can't help thinking it was done for fashion sense. It reeks of a good backpack designer being handed couple bad pictures and being told to "Make one of these, but better, and by Monday."

The fly is REALLY nice, with mesh pockets for stowing stuff, but made out of VERY heavy materials (aluminized too). Weirdly it has big tigh-down loops out of 1.5" webbing that are about 12" long, and sprouting out of odd locations (like halfway down the wall/door side seam).

Whole rig weighs in at 28.5 lbs for ledge/fly/haulbag. Truly a masterpiece.



**mucci**

Trad climber  
The pitch of  
Bagalaar above you

Feb 23, 2017 – 10:39pm PT

But my A5 single is just hitting its prime?

Heh

Looks great John, glad you are back in the mix.

Cheers



**John Mac**

Trad climber  
Breckenridge, CO

Feb 24, 2017 – 07:43am PT

John, What are your plans at Mt Buffalo. Are you going to do a route on the North Wall? Ozymandias? Must still be pretty warm down there.

Moof ... I thought the BD ledge was heavy!



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Feb 24, 2017 – 09:53am PT

OK, guys – time to get on to John's next innovation. I am not sure above if anyone has guessed, or possibly even seen, but time to put it out there: the corners.

So ..... what has John done with the corners, that is absolutely different from every portaledge ever made? [so far as I am aware]

What kind of corners are hidden in the photo of the frame that Marek is attempting to deflect, without any apparent success?

John has spoken of the horrific "open corner" design, and its inherent stability. I have always hated that open corner design, because I have never found it any easier to assemble or take apart a portaledge that has open corners.

John has also revealed that he is not using block corners either! So what has he done?

Blue noticed and commented on the suspension system, which is barely visible in the photo above his post on the previous page. Have a look at the suspension system, and then ask yourself, why does it avoid the corners?

The magic number is no longer six, it is four. Why?

Finally, when is a corner NOT a corner?

If you are feeling flummoxed, then perhaps you need to ask Wolfman Jack. The Wolfman already revealed the truth a few pages above. [HINT]

[Click to View Linked Image]

[I used to be a Wolfman, but I'm all right now-oooooooooooooooo.....]



**BLUEBLOCR**

Social climber  
joshua tree

Feb 24, 2017 – 10:10am PT

[Click to View YouTube Video]



**John Mac**

Feb 24, 2017 – 02:04pm PT

That's what I'm thinking as well. No joins on the corners.



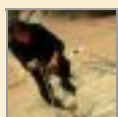


**DrBen**

Trad climber

Feb 24, 2017 - 02:15pm PT

Looking forward to seeing these new Portaledges. If I'm reading it correctly you are saying they'll be ready in September John?



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 24, 2017 - 02:23pm PT

We are making a limited first batch of 28 ledges for September, 2017 shipments. These will be sold at a significant discount to get us started. We're hoping to sell out of Batch #1! Then major production planned for 2018 delivery.

Make sure to sign up for the Kickstarter newsletter (Kickstarter goes live on March 1) to get one of the 2017 batch:  
<http://eepurl.com/cDn3kT>



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Feb 25, 2017 - 03:36pm PT

[\[Click to View YouTube Video\]](#)

Here's John's interview with Tasmanian radio. You can hear about all the "chynge" in his design. Be sure to expand to full size to see the photos - very entertaining!

You can go to John Middendorf dot 'neet' for more info!

Also, here is the direct link, so you can go to full size:

<https://www.youtube.com/watch?v=CxNP-3cZO4E>



**WBraun**

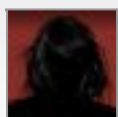
climber

Feb 25, 2017 - 07:05pm PT

Loved that video John and shows the evolution of your diverse interesting life.

I really liked the part where you are the school teacher.

And not only being just some one trick pony .....



**nah000**

climber  
no/w/here

Feb 26, 2017 - 07:46am PT

i'm also guessing the corners are continuous curved pipe and the connections are at the centre of the straight lengths of pipe and consist of smaller diameter pipe slipping into shortish sections of larger diameter pipe. gets rid of the heavy block corners and at the same time the smaller pipe slipping into a larger pipe negates the need for spreader bars.

if correct, it is a simplistically and beautifully elegant solution as all design should be on at least some level.

regardless, lookin' forward to the big reveal of all the innovations...



**phylp**

Trad climber  
Upland, CA

Feb 26, 2017 - 08:14am PT

I'm not an engineer.  
I'll never use a portaledge.  
But what a cool thread!  
I remember reading articles about your wall climbs ( a long time ago!!).  
Best of luck to you!

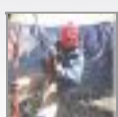


**drljefe**

climber  
El Presidio San  
Augustin del Tucson

Feb 26, 2017 - 10:14am PT

Great interview!  
All the best!



**WBraun**

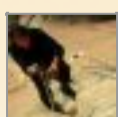
climber

Feb 26, 2017 - 09:37pm PT

John (deuce4)

Have you ever seen this stuff?

<https://www.kickstarter.com/projects/braeon/braeon-worlds-strongest-and-most-adaptable-materia>

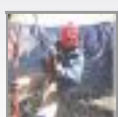


**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Feb 27, 2017 - 02:24am PT

Hi Werner--No, haven't seen that stuff. A polymer of some sort. There are a lot of strong fibres being created today. I'm suspicious though that they don't give more technical details. Though perhaps I go overboard in that regard! ;)



**WBraun**

climber

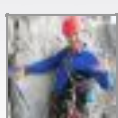
Feb 27, 2017 - 07:55am PT

I was suspicious too.

The stuff is not UV resistant. It deteriorates in the sun.

It has some cool uses for it.

It will be expensive? They are saying one dollar per foot .....



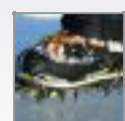
Feb 27, 2017 - 08:47am PT

Yup. My concern too is resistance to UV in the sun.

**'Pass the Pitons' Pete**

Big Wall climber like Ontario, Canada, eh?

Typically I flag my ledge from the bottom of the wall to the top. And on a south facing crag like El Cap, that's a lot of photons!



**Damo**

climber

Feb 27, 2017 - 06:59pm PT

<http://www.abc.net.au/news/2017-02-27/john-middendorf-reinvents-portaledge-for-extreme-climbers/8306108>



**BLUEBLOCR**

Social climber joshua tree

Feb 27, 2017 - 07:28pm PT

*Typically I flag my ledge from the bottom of the wall to the top. And on a south facing crag like El Cap, that's a lot of photons!*

Hey, what about a solar collector fly? Then you could watch netflixs and run a 12v icechest 😊

Or, for shitz and giggles. Why the need for a ledge haulbag. Maybe jus a slot in the pig. Or if it's getting flagged anyway, how about the ledge "haulbag/container" multi use as a pootube? After summit toast'sss.... go bury the shite and stow the ledge 🤔



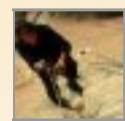
**deuce4**

climber Hobart, Australia

Topic Author's Reply - Feb 28, 2017 - 02:30am PT

Kickstarter for the new D4 Portaledge going live 12pm Noon Yosemite Time, Feb 28. (That's 7am, March 1 Hobart, Tasmania time). Keep posted at <http://facebook.com/bigwallgear> for Kickstarter link.

Cheers  
John Middendorf



**deuce4**

climber Hobart, Australia

Topic Author's Reply - Feb 28, 2017 - 01:04pm PT

Live link here! <https://www.kickstarter.com/projects/1188459201/the-d4-portaledge>

Sold the first three before I could even send the link out!? How did that happen? Then another 5 in the next 5 minutes. You guys are keen--we will make some good ones for you, and get them to early backers first, probably well before September.



**Clint Cummins**

Trad climber SF Bay area, CA

Feb 28, 2017 - 05:13pm PT

Cool.  
At present, 14 of the next 25 (for 9/2017 delivery) for \$975 are sold.  
After the remaining 11 are sold, then it's \$1,140 for 2018 delivery.

I still use one of your A5 haulbags, bought back in the 80s!  
I haven't done a wall with a portaledge in awhile; just the walls with built in ledges these days.... :-)



**'Pass the Pitons' Pete**

Big Wall climber like Ontario, Canada, eh?

Feb 28, 2017 - 05:59pm PT

For your next revelation, CLICK THIS LINK AND WATCH THE VIDEO:

<https://www.kickstarter.com/projects/1188459201/the-d4-portaledge>

Sorry, it's not on Youtube so I can't hotlink the video directly here. You will actually have to click.



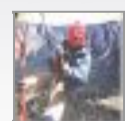
**John Mac**

Trad climber Breckenridge, CO

Mar 1, 2017 - 07:15am PT

19,878 as of this morning ... 26K is the target.

I was hoping they would have a t shirt up for sale...



**WBraun**

climber

Mar 1, 2017 - 12:38pm PT

Go Deucey Go Deucey Go Deucey Go Go Go .....



**deuce4**

climber Hobart, Australia

Topic Author's Reply - Mar 1, 2017 - 01:08pm PT

20 ledges sold the first day! Really appreciate everyone's support. We will be working hard to ensure the best ledge to everyone. Really fun to be back in design, working on the haulsack details this morning... And tinkering with the superlight Single version and MiniMe ledge as well as another half dozen or so D4 Double prototypes going out to big wall product testers in the next couple months...

Only 8 left for our 2017 batch--they are going quick! Production on the Kickstarter batch planned to begin in April.



**deuce4**

climber Hobart, Australia

Topic Author's Reply - Mar 1, 2017 - 01:16pm PT

Really psyched how compact everything folds up--this is the ledge, the fly (and fly pole), all in about a 12" x 33" x 6" pack. Really easy to carry around and put into a pack or haulbag. No more wondering what haulbag the fly is in! All deploys very readily.





D4 Haulsack ver3

Credit: deuce4

**D4 Ledge set-up sequence with new ez-deploy haulsack**



**Ledge and fly can be packed and unpacked as a unit for quick deploy. Haulsack has pockets for fly and poles. No more jumble of fabric and tubes coming out of a sack.**

D4 Deploy Haulsack

Credit: deuce4



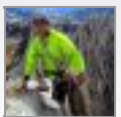
**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Mar 1, 2017 - 04:15pm PT

Holy crap, dude - you never told me ^^ THAT!! ^^

Bloody brilliant, mate.



**micronut**

Trad climber

Mar 1, 2017 - 04:48pm PT

Lookin good man. Fun to see it all come together. You left one thing out though. Get back to the drawing board mate!





**BLUEBLOCR**

Social climber  
joshua tree

Mar 1, 2017 - 06:27pm PT

^^^Hahahahaha.. would'a doin growin pot 😂

Edit, and WOW! on that set up. Looks dreamy 😍



**the Fet**

climber  
Tu-Tok-A-Nu-La

Mar 1, 2017 - 09:42pm PT

The ez deploy looks great. It's nice to see ledge design finally getting more advanced after many years of stagnation.

But its kinda sad that someone who did Trango now takes multiple days to get up an indoor wall.



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Mar 1, 2017 - 10:17pm PT

^^ It's about the journey, not the destination..... ;)



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Mar 2, 2017 - 10:43am PT

We made our Kickstarter goal! So we will be building the new D4 for everyone! Much appreciated!

The fun part now is documenting the next few months of continual prototyping, getting feedback from the pros in the field, and refining the details of our design for the batch of 28 for September. Stay tuned for updates here:

<https://www.kickstarter.com/projects/1188459201/the-d4-Portaledge>



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Mar 2, 2017 - 01:16pm PT

Congrats on the Kickstarter, Deucey! It's great to see so much interest in your bitchin' new ledge design.

*"...getting feedback from the pros in the field..."*

And also from the Big Wall Parvenus. ;)



**Mike.**

climber

Mar 2, 2017 - 02:20pm PT

Nice going and congrats!

*Superlight single*

Okay, you have my attention now...



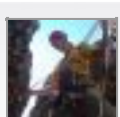
**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Mar 2, 2017 - 02:56pm PT

Right at the top of the Grippd Magazine webpage now!

<http://grippd.com/news/d4-portaledge-revolutionizes-big-wall-sleeps/>

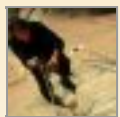


**Rock!...oopsie.**

Mar 3, 2017 - 07:46am PT

As an aside - nice FPV racing drone collection on the wall in the background!





deuce4

climber  
Hobart, Australia

Topic Author's Reply - Mar 3, 2017 - 07:16pm PT

<https://www.facebook.com/thetreeprojects/videos/598241450369089/>

Getting these guys one to test out the tree-worthyness--my tests in a tree showed almost no flex with 2 adults and 5 kids. Looking forward to hearing how Jen and Steve do.

Check out their awesome work here: <https://www.thetreeprojects.com>



'Pass the  
Pitons' Pete

Big Wall climber  
like Ontario,  
Canada, eh?

Mar 9, 2017 - 09:24am PT

In case you missed it at the bottom of the last page,

CLICK ON JOHN'S NEWEST VIDEO: <https://www.facebook.com/thetreeprojects/videos/598241450369089>

If you go to the video where he shows the titanium ledge they used on Great Trango Tower, this is around -1:59 on the video, you will see the **design flaw**:

Look at the portaledge straps, and you will see that there is not enough "adjustability" built into them. This has been a CONSTANT problem of all portaledge designs [except Fish]. The problem with lack of adjustability occurs during the too-frequent situation where your belay anchors are too close together.

If you are climbing a trade route, and you have a nice wide horizontal spread of bolts and anchors, it is easy to set up your ledge and pig far enough apart, so that your ledge hangs symmetrically next to your pig for easy access in and out of your pig. Because the anchor bolts are well spread, the straps on either end of your portaledge are all about the same length - a symmetrical hang.

Truly this type of camp setup is more Big Wall Theory than Big Wall Fact. Quite often the anchor bolts are very close together. What if you only have a two-bolt anchor? In this situation, the pig and the ledge hang too close together. What you need to do is to "shorten" up the straps on the "pig" end of the ledge, and "lengthen" the straps on the other end of the ledge to give yourself an asymmetric hang. Hopefully this will allow you to hang your ledge and pig side-by-side for easy access.

In virtually all portaledge designs [except Fish] there is not enough "adjustability" in the straps. This is particularly annoying in really big ledges. Some of those monstrosities like the Anker and the BD have some tiny amount of adjustability like only 16 inches. On hangs where the anchors are close together horizontally, it is impossible to get a proper hang!

If you look on John's video above at his old Trango ledge from the 90's, you will see this **design flaw**. Look carefully at the straps on this ledge [you will have to pause the video] and see how little adjustability there is. This is the problem that has existed for so long in so many [crappy] ledge designs!

The new D4 ledge has **fixed this design flaw**. The D4 has a properly adjustable suspension system, with near infinite "adjustability", so you can get this baby set up comfortably on even the most "asymmetric" of hangs, where the bolts are too close together.

In all the various features and benefits for big wall camping that the D4 offers, this was - to me - the most important problem in current ledge design that needed fixing.

You're going to love it!

Also, if you have never seen this video of JOHN SETTING UP THE LEDGE, then please click here:

<https://www.facebook.com/bigwallgear/videos/402269260150407/>



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Mar 11, 2017 - 08:30pm PT

[[Click to View YouTube Video](#)]

I have been setting it up and taking down about 8 times now, and I have it down to about 90 seconds set up and less than a minute packup. Way quicker than what you see in these initial videos, which were both early setups before practicing setup much ( although even in these videos it was pretty smooth and quick to set up with no clusterf\*#ks or hassles).

Way easier than my old block corner design and of course no spreader bar to struggle with.

We still have some more available for pre-order at the sale price of \$1080. An awesome good deal if I don't say so myself as the more I use this ledge the more I realise it is really a game changer for big walls, especially for remote big walls where light is right and extra messing around with setup and fly deploy in rough conditions can really be taxing. We are not compromising on materials ( and will likely only break even on the Kickstarter batches). Hopefully we will continue producing them past the Kickstarter sales, but you never know. My primary aim is to get them into the hands of climbers like Libeck and Twid Turner and Marek Raganowicz who need better tools like a lightweight and compact full-size ledge system to help push their endeavours, so that is already being accomplished, but of course these ledges will help benefit everyone's big wall experiences. So order yours now!

The D4 portaledge will be available on Kickstarter for a few more weeks. (note, I am being conservative with delivery dates--once we finalise the details of the design in the next month or two we will be producing them and delivering on first ordered, first shipped basis from Durango, so the ones ordered now though Kickstarter may well be delivered sometime later this year).

<https://www.kickstarter.com/projects/1188459201/the-d4-portaledge>



Mar 11, 2017 - 09:57pm PT

Nice job Duece!



BLUEBLOCR

Maybe you otta give one to Anita and have her make a video setting it up. Bet it would go viral 🍀

Social climber  
joshua tree



**Tom Patterson**

Trad climber  
Seattle

Mar 12, 2017 - 06:37am PT

This is fantastic, John! Best of luck in this endeavor!

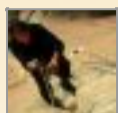


**BLUEBLOCR**

Social climber  
joshua tree

Mar 15, 2017 - 06:45am PT

Are there gonna be any singles for purchase this season?



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Mar 18, 2017 - 01:27am PT



The D4 makes for a great belay ledge. Had it packed and shoved in the haul bag (with nothing sticking out, despite the fact that the haulbag had everything else already in it) in quicker time between the "rope's fixed" and "ready to haul" calls.

Credit: deuce4

Just finished a couple nights on the portaledge on Ozymandias, Australia's iconic big wall. The D4 portaledge worked great--incredibly stable and rigid, I was very happy that it performed in all respects better than any other ledge I have designed.

See the Kickstarter update #3 for more pics, and also the Facebook bigwallgear page.

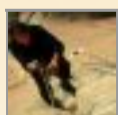


**the Fet**

climber  
Tu-Tok-A-Nu-La

Mar 18, 2017 - 11:20am PT

This thread was in this month's SuperTopo Climbing News email. I was just a little early on my prognostication. 8^)



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Mar 18, 2017 - 01:15pm PT

Yeewhaw!

By the way, if readers could consider contributing even the \$10 option on the Kickstarter, that would help contribute to the current production of demo prototypes that are going out to our first product testers (besides me), for teams like Marek, Twid Turner, Mike Libeck, and others for whom we are supplying ledges for some extreme expeditions. Thanks!!!

<https://www.kickstarter.com/projects/1188459201/the-d4-portaledge>

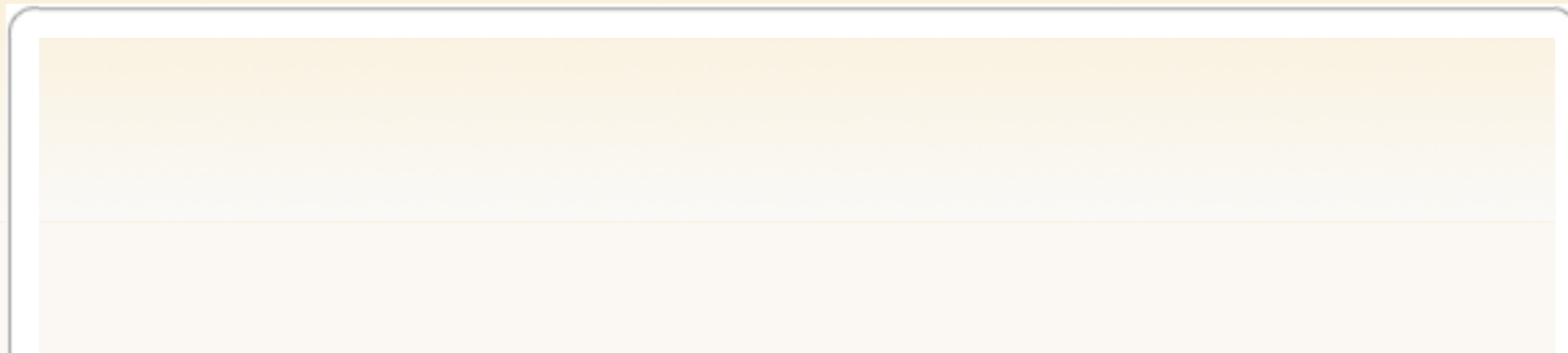


**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Mar 20, 2017 - 02:50pm PT

Tarkine protest last weekend...







D4 ledge in the Tarkine Protest

Credit: deuce4



'Pass the Pitons' Pete

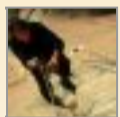
Big Wall climber like Ontario, Canada, eh?

Mar 20, 2017 - 04:01pm PT

Right then, tell us how it worked!

- How stable is the four-strap suspension system vs. the traditional 6?
- How well did the shark fin suspension points work?
- Was it as easy to set up and take down as you said?
- Could you do it in 90 seconds on the wall?
- What do you think you did really well?
- Now that you have tested it, what changes if any are you going to make?
- Does it come with a beer cozy?
- Does it come in pink for Anita?

Cheers, mate!



deuce4

climber Hobart, Australia

Topic Author's Reply - Mar 20, 2017 - 11:50pm PT

[quote]Pitons' Pete

All good questions!

I am very pleased with the 4/8 point suspension system. It is more stable when hanging out in the ledge, I think because alternatively with a six-point system the center support point acts a bit like a see-saw fulcrum point. I recall back in my wall days much more ledge shifts when moving about the ledge--there was none of that on the two days we hung out in the ledge on Ozymandias--it never really ever suddenly shifted when we were moving about the ledge. The fact that each fin equalizes the load to two points is also key to not only the strength, but also the stability. On the other hand, I was wary that there would be a more dramatic tipping if the center of gravity ever passed to the outside of the suspension points, though this never happened, even when I was settled in on one side of the ledge and Simon stood up and stood more on my side of the ledge.

Other advantages are easier setup as it's much more obvious if the frame is getting wrapped around one of the four suspension fins when first deploying (this did happen once after a sloppy packup job), but it was easy to fix by just undoing and redoing the quick link.

And of course the four points instead of six saves weight! And simpler.

I also discovered the tacing really doesn't matter when setting up--though all the tubes more naturally slip into place when the ledge is fully "flat" and un-tacoed, it didn't really matter because as soon as the ledge was weighted, it seemed to naturally become flat and level after adjusting the suspension. But I do recommend getting rid of any taco before fully tensioning the bed tensioners before getting into the ledge.

It just got easier and easier to set it up as I used it more--probably not 90 seconds while hanging, but certainly within 3 minutes, and probably most of that time is in tensioning the bed, which is a simple task. I have incorporated plastic helpers on each of the end tubes which keep the tubes somewhat in place during assembly, and there is a moment when one end tube is held by the plastic keeper, but not all the way in yet, where one needs to gingerly turn the ledge (or move) to the other side to assemble the other end otherwise the first end could fall out of the plastic keeper--as I got better at doing this, it all went together without any snafus, and this was the only time I ever felt like I had to be careful.

I plan to annotate a sequence of setup to explain this more fully. Basically long tubes first, then end tubes, then tension the bed, and you're done. Especially considering that there is no spreader bar, I'd say it is twice as easy to setup than my previous block corner design.

Packup was literally less than a minute, especially after a night with the fabric a bit pre-stretched. So easy with the new D4 haulsack design.

There are some minor tweaks I am making to the strap lengths, for example, I want the shark fin divider faster to be within easy reach even when barely sitting up so it is way easy to change from sleep position to hangout out time with backs to wall. Also I have some really cool fly modifications which I will be working on this week (removing my speedy stitch mods with some real sewing!).

Overall, more pleased than even expected with how it works--really an improvement in existing ledge design in all aspects.

Will be posting an update with similar information on the Kickstarter soon, along with more photos and details.

Still 17 left at the Kickstarter discount! <https://www.kickstarter.com/projects/1188459201/the-d4-portaledge>



**duncan**

climber  
London, UK

Mar 21, 2017 - 07:42am PT

[Click to View Linked Image]

Portaledge design c.1982

- Oversized aluminium tubes
- 4 point suspension
- Curved corners

On the first punter's ascent of the PO Wall. JM, you may recognise the model!



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Mar 21, 2017 - 11:40am PT

Nice rig! And nice partner! I think that was soon after we had climbed the Zodiac? Great photo!

(Those things weighed about 20kg, didn't they?). Back to our roots!



**John Mac**

Trad climber  
Breckenridge, CO

Mar 21, 2017 - 01:30pm PT

A young Lydia... first woman to climb the big E without O2.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Mar 21, 2017 - 08:24pm PT

Trip report of our recent Ozymandias climb here: <http://www.supertopo.com/tripreport/tripreport.php?articleid=13126>



**'Pass the Pitons' Pete**

Big Wall climber  
like Ontario,  
Canada, eh?

Mar 21, 2017 - 11:16pm PT

Interesting point about the six-point suspension having the see-saw fulcrum point in the middle cuz of the two middle straps. Never thought of that but it makes intuitive sense.

Don't you make those buckles too low! I would far rather stand up to adjust the straps, than to sacrifice any "adjustability" for asymmetric hangs, especially when there are four lovely daisy clips in each strap for me to hang my stuff off of!



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Mar 22, 2017 - 07:47pm PT

Down to 16 left at the Kickstarter discount!



**duncan**

climber  
London, UK

Mar 24, 2017 - 03:10am PT

THAT Lydia, a very nice partner who wasn't a punter at all, but neither of us had done many walls and we imagined ourselves first team to do the route who were not the usual Yosemite suspects.

That ledge was a heavy old thing, the D4 looks sweet!



**deuce4**

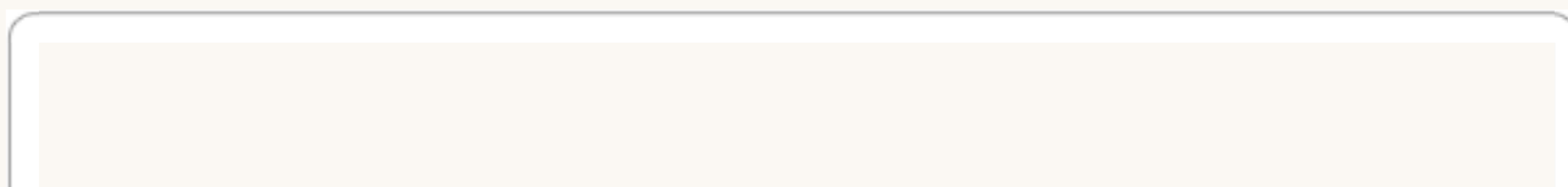
climber  
Hobart, Australia

Topic Author's Reply - Mar 24, 2017 - 11:15pm PT

Updated setup video here:

[Click to View YouTube Video]

NOTE: Steve Pearce of the [The Tree Projects](#) has found it easier to set up the end tubes first (making two big U's), then the long tubes. Initial testing on the ground confirms this, is likely another benefit of the unique D4 design (this wouldn't be possible with the block corners, as the corners would offer too much flex when setting up and would probably fall out of the joint, but the U's in this case are completely rigid and ready to accept the middle poles on the long side.) It is more important to ensure that the long tubes are all fully inserted with this method, but of course, getting to know any ledge by practicing, and ensuring that all joints are fully inserted is essential no matter what method of set-up--this is clear and easy with the D4 because the joints offer an audible "click" when fully inserted, and can easily be checked by pulling tubes slightly apart then letting them snap back for the "click", thanks to the shockcord.



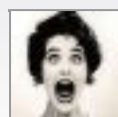




climber  
Hobart, Australia

redesign of the frame for the larger "full-size" ledge platform (reminds me, to have a party soon to load up one of my prototypes with six or seven people, then everyone jump up and down until something breaks--the obligatory "Everyman" test!).

As mentioned, i am playing with carbon fiber, but the frame itself is really only about 1/3 of the total portaledge weight, and though carbon would indeed lighten the ledge a couple pounds, the cost is still way too much. I also really don't think the carbon would be as durable in a big wall setting, but still, would like to make one or two for that key expedition to Jannu!



**Moof**

Big Wall climber  
Orygun

Mar 27, 2017 - 03:06pm PT

Thanks for the clarification John.

I overthought my carbon frame for sure, and threw away a large portion of my weight savings on excessive reinforcement. What is hard to discern until you start shelling out \$100's for carbon tubes is that most of the poles are made almost entirely of unidirectional fibers with just a single outer layer of woven fabric mostly for aesthetics. Crush resistance is not great as a result, and I feared a sharp nubbin creating the start of failure. I also feared the corners crushing the ends if things torqued funny under load. I think your new invention is the clear way to go.

Using CF as the internal double butting on the sides probably is where the most bang for the buck of stiffness and weight savings, but would add absolutely zero to the look of your design. CF sadly has poorly controlled OD, and the ID tends to be right at size, so it becomes necessary to either sand the CF, or machine down the aluminum to make joints with acceptable clearance. I am really curious to see what you come up with, your string of recent ideas is innovating where I have dumbly assumed things were pretty well rung out.

One follow up on the now obsolete corner blocks. The A5 design always had the short end poles plug into the corner blocks that were permanently affixed to the the side poles rather than the other way around. I have always been perplexed by this choice. What is the wisdom of that choice? What bad stuff happens if the corner blocks were instead affixed to the end poles?

Thanks again!



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Mar 27, 2017 - 04:35pm PT

Good point Moof. Might just be another carryover of the "old" way of doing things which was never really been re-thought (it does amaze me more and more, as I develop this new design, that the "old" way has been the status quo for the past 20 years with the main manufacturers, as everytime I actually use or make a new one, new and better ways pop up naturally!)

Anyhow, probably the reason I made it a right angle corner is that the original ledges were made before we invented the bed tensioner concept. So with a tight bed with no other adjustability in the tension, it was easier to lever the corners onto the end tubes, rather than the other way around. I think I did make a round cross section corner at one point that I think set up the alternate way you describe, but didn't like the way the end tube fit into the perpendicular hole drilled into the side of the round cross section corner piece. Not sure if that is clear, never mind, I can try to find my old sketches perhaps, but in any case, with bed tensioning, perhaps the corners fixed on the end tubes and fitting on the long tubes would be a better way to go.

Cheers



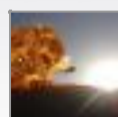
**cadl**

Trad climber

Mar 27, 2017 - 06:41pm PT

John, any issues for the triangle fabric suspension points if the anchor is off-center? For example if the belay is in a dihedral and the anchor bolts are less than 3 feet from the dihedral corner, the straps will be shorter on one side to compensate for the off-center anchor. Seems like this would create stress points on the triangle fabric attach points.

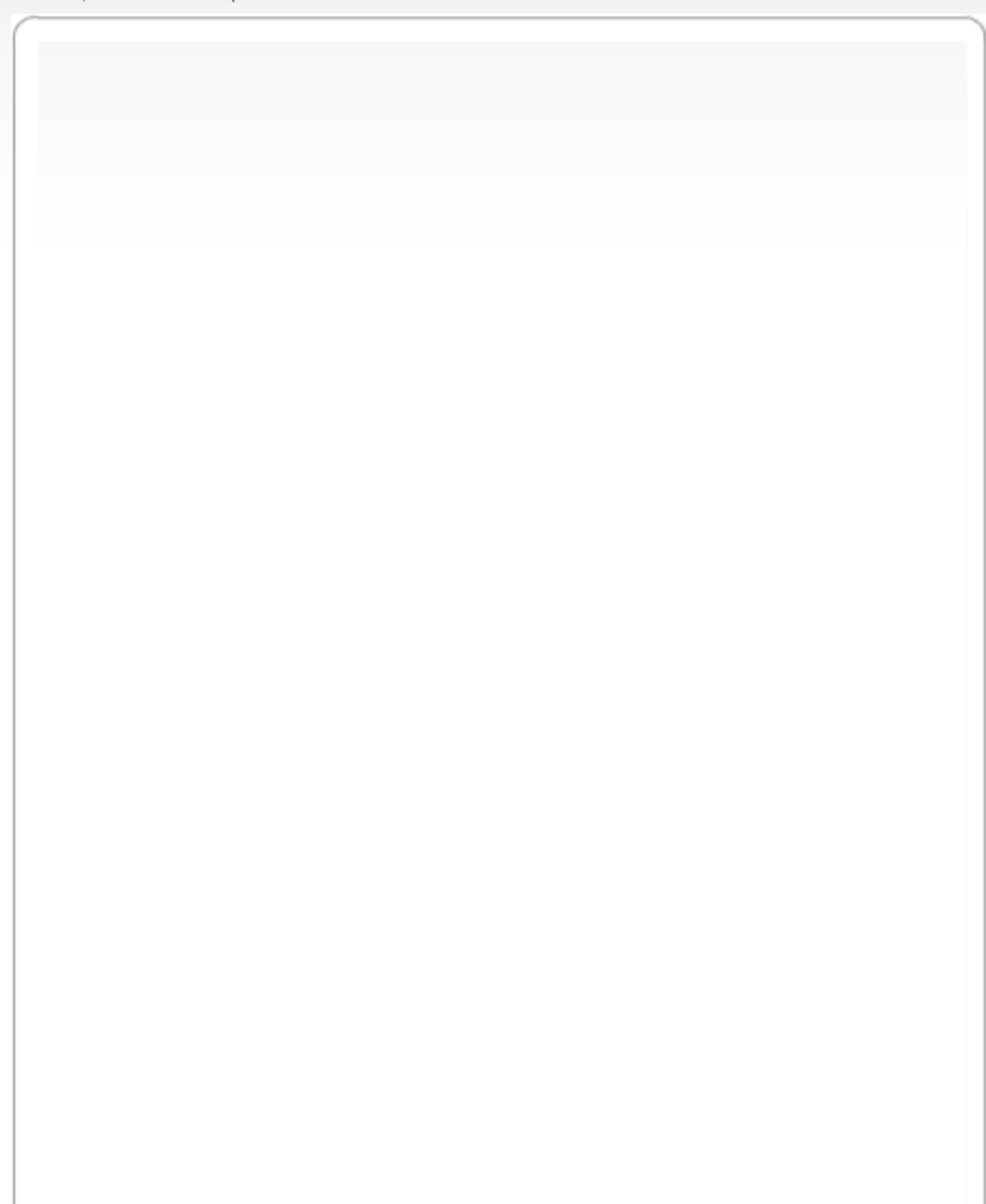
Thanks for your latest project and continuing contributions to the "state of the art"! Much appreciate by many.



**jeff constine**

Trad climber  
Ao Namao

Mar 27, 2017 - 06:55pm PT







Credit: jeff constine

Spreader bars have uses!



deuce4

climber  
Hobart, Australia

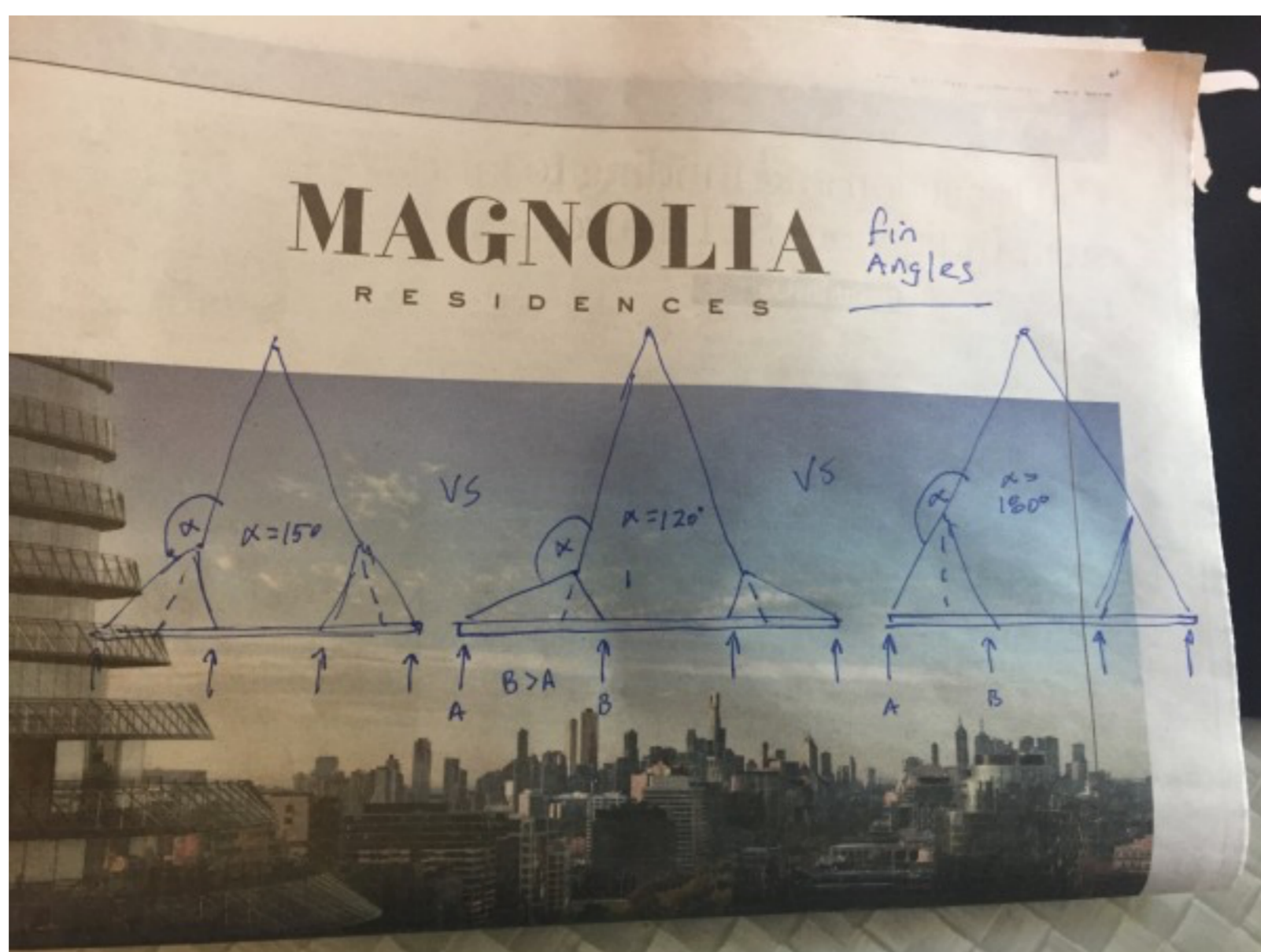
Topic Author's Reply - Mar 27, 2017 - 07:08pm PT

Hi Cael

The way I have designed the four/eight point suspension is that a majority of the load is on the webbing connections (2 per fin) rather than the fabric, and they equalize somewhat when, as you say, there is an off-center loading taking place. Due to the greater stretch of the fabric, the fabric simply creases to adjust in such as case. The benefit of the fabric is that it does actually take part of the load in a more distributed way.

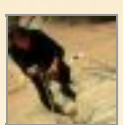
It was indeed mostly theory for me, too, until I actually tried it on actual rock with off center loadings, plus I have played with it in my gym with most extreme off-center loadings, and the equalising concept does seem to redistribute forces as conceived in this type of situation.

If there are any engineers out there, I actually wouldn't mind a second opinion on the statics analysis. Here's a start (as all good things begin on the back of an envelope, or extra white space in a paper in this case...):



anyone want to have a go at Statics?

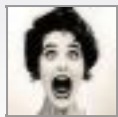
Credit: deuce4



deuce4

Topic Author's Reply - Mar 30, 2017 - 01:58am PT

Only a few days left to order a D4 Portaledge. It is very likely all Kickstarter orders will be shipped before Wall season ends this year! Cheers



**Moof**

Big Wall climber  
Orygun

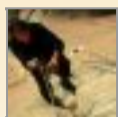
Mar 30, 2017 - 03:48pm PT

I'll bite on the 4/8 point suspension. Still working on the math a little, but I'll start with a few assumptions necessary to get started.

- 1) I assuming that A and B are fixed locations so as to distribute the load over the frame/bed kind of evenly.
- 2) Further I am assuming that ideally the tension on each of the 8 points is desired to be balanced (force on the bed at A and B equal). Having just a loop guarantees this due to the quick link acting as a pulley for this kind of analysis. This basically means you have to solve for the resulting angles rather than choose them, since things auto equalize. Should I NOT assume the real world pulley action and solve per your picture? I'll keep going with the pulley action for now.
- 3) The free variable is then the length of the strap connecting A and B. If it is very long you get 8 straps with zero force multiplication, but that is dumb. Make the strap short and there is huge force multiplication. So a good engineer needs to set some target to trade off excess stress trying to rip apart the bed and extra weight from having 8 full length straps. I am choosing a 20% force increase to back calculate the strap length and resulting angles, and will play with this when I have the math figured out..

I am further only going to look at the outside straps where the force is the highest, and assuming a 4' wide ledge body and 5' distance from the anchor down to the bed elevation to be able to calculate all this. I am going to put A 1' from the end pole and B 1' from that (3' in between B to B for a 7' ledge). Reasonable? I am probably missing an obvious simplification as to what I should be solving for, but I am an EE and my statics/physics has about 23 years of rust on it.

Green paper to follow...



**deuce4**

climber  
Hobart, Australia

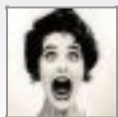
Topic Author's Reply - Mar 30, 2017 - 04:42pm PT

Moof, you are on the right track, but in addition to stability, I designed the fins to support more of the middle as well. I can send you the specs I created, but would be interested to see what angles you determine first.

Yes, you can assume that the load is distributed equally between each of the two straps in each fin--though of course the fabric does take some of the load in a distributed way (for the better), I ignored this in my analysis. But real-world testing showed this to be largely the case--also when the ledge is set up in a corner, the load does shift a bit so the ledge is better optimally supported by the eight main points of connection--you will start to see how once you do some engineering statics, as the angles change.

Cool, looking forward to seeing what you come up with.

Bottom line, I tested them on a real wall, and the idea works!



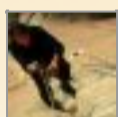
**Moof**

Big Wall climber  
Orygun

Mar 30, 2017 - 04:59pm PT

Yep, the vertical fibers of the fabric help spread out the load for sure, but that is well beyond first order statics that I can hope to tackle. If you want to get pedantic the fins should be catenaries (asymmetric ones at that) to provide equal tension along the length of the fabric for a point load at the apex. But at that point you are jumping the shark pretty badly.

I'm looking forward to getting an hour or so of tinkering time this evening after kiddo's bedtime to pencil it all out better.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Mar 30, 2017 - 05:45pm PT

Interesting you bring up catenaries--my first prototype I did indeed design it with a catenary, but it turns out the longitudinal stiffness of the webbing on the edges prevents the edge from taking the load like a catenary--hence the straight lines on the support fins. The interior shark fins, however, still are designed with catenaries.



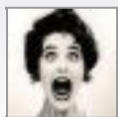
**Todd Eastman**

climber  
Bellingham, WA

Mar 30, 2017 - 08:44pm PT

Wind's shifting, getting smoke in my eyes...

... great campfire!



**Moof**

Big Wall climber  
Orygun

Mar 30, 2017 - 09:17pm PT

So I get to the angles pretty easy.

Since you can assume equal force on the two straps at A and B, the angle relative to the main strap is also equal. The force multiplier is  $1/\cos(180-\alpha)$ , which works out to 33.6 degrees for a 1.2:1 force multiplier, or 67 degrees maximum total angle of the fin. I am guess you rounded to 60 degrees?

The angle of the main strap works out to about 21 degrees, so the would for out to an angle of 9 degrees off vertical at B, 51 degrees from vertical (39 degrees from the bed) at A if using 60 degrees for the fin angle.

Sound about right?

Still need to figure out the height of the fin, but my eyes are trying to close on me.

Unless you wrapped the webbing around the fin edge taco style before stitching, I don't know how to get around the stiffness to get a catenary, but again, that is just overkill to begin with.

Edit:

Looking at the pics it looks like you chose 45 degrees, which would put the B point within rounding error of 0 degrees, making much more sense than 60 degrees. Force increase would be just  $1/\cos(22.5)=1.08$ , or less than 10%. Ideally the fabric would be cut on a 22.5 degree angle, but that is pretty wasteful for a marginal increase in load spreading. My in-process Ghetto4 ledge will shamelessly copy this approach, though I am aiming to only put bed tensioners on one end to simplify/lighten.





D-Rail

Trad climber  
Calaveras

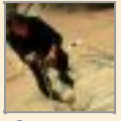
Mar 30, 2017 - 09:17pm PT

Looks amazing Deuce!

I have an Alpine Double that is well traveled. It is probably from about the same vintage as your Jumars. Months of detailed work to update the portaledge and you still roll with the old trusties?

Keep it coming. This is great stuff!

Daryl



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Mar 31, 2017 - 06:42pm PT

Last day to order your Expedition D4 Portaledge on Kickstarter!



Credit: deuce4

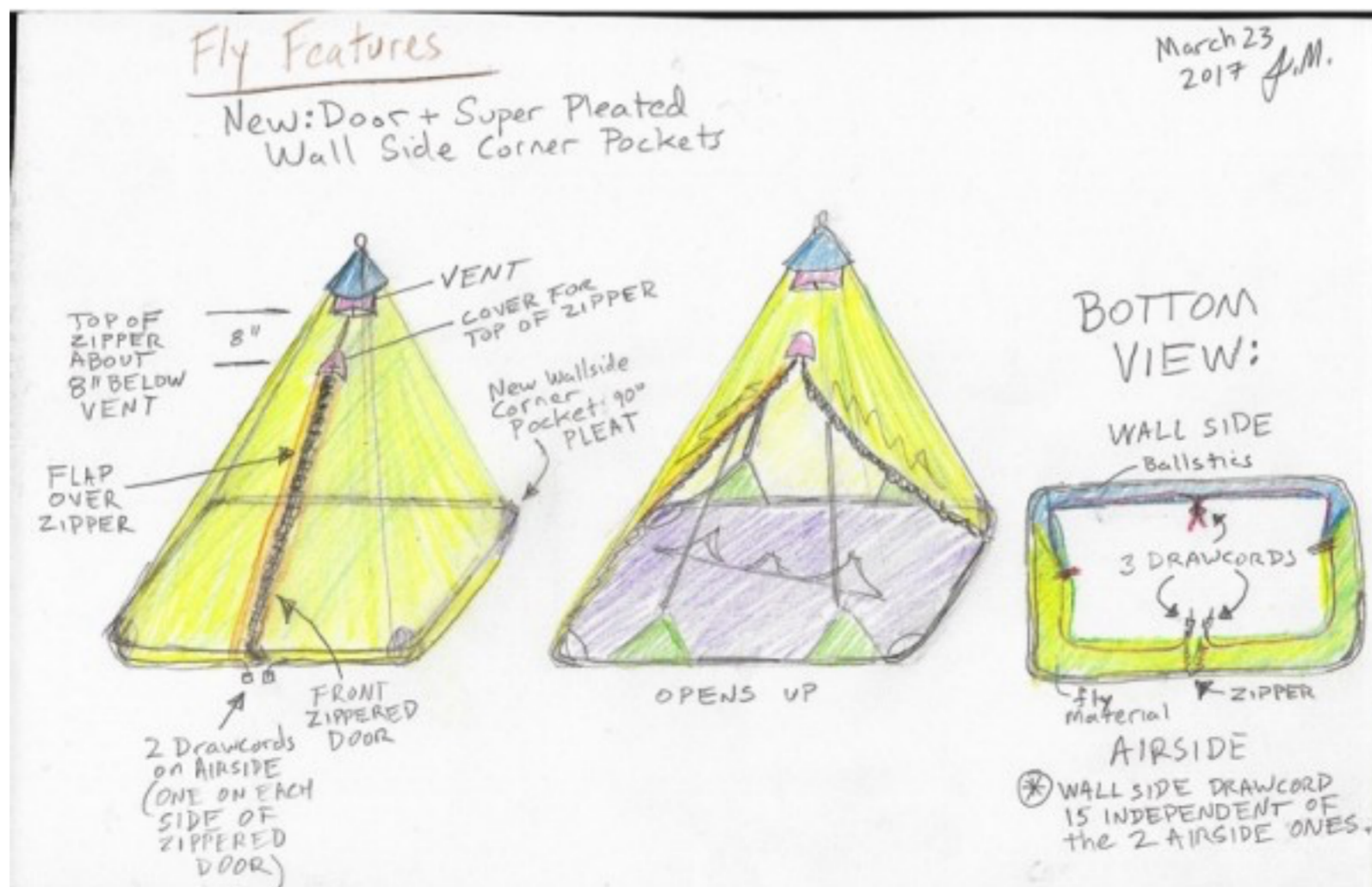


deuce4

climber  
Hobart, Australia

Topic Author's Reply - Apr 1, 2017 - 07:58pm PT

The new D4 Zippered Door Design has gone from concept (imagined while climbing Ozymandias) to first functional prototype in a couple weeks! This new door and vent design will be sent out to Twid Turner this week for full conditions testing on a big wall in Alaska.



Concept and image copyright John Middendorf, 2017

Credit: deuce4





New D4 Door Design by John Middendorf

Credit: deuce4

There's only 12 hours left to order a D4. I have been open with the design process so all can see how the innovation has progressed, and if history is any guide, these new concepts will be widely copied, but the original is always the best! Thanks for your interest! Cheers, John Middendorf.



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Apr 2, 2017 - 02:12pm PT

The Kickstarter has successfully ended at 150% of goal! Many thanks to everyone who supported this reinvention of the modern expedition Portaledge. We will continue our product testing and begin production in the coming months.

We have already gotten new requests for orders for the D4 portaledge. Of course we will fulfil our Kickstarter orders first, and will set up a waiting list for future orders. All Kickstarter orders are expected to ship this year. Thanks again to all!



Moof

Big Wall climber  
Orygun

Apr 9, 2017 - 04:46pm PT

Got inspired for my own hobby ledge. Ordered up the crap and I am now assembling.

First step was to cut most of the tubing (one piece is still in transit). Never used a tubing cutter on aluminum, so much easier, cleaner, and nicer than hack saw and files. Who knew?! Next step was to start glueing things up (less eerror prone than rivets for me).



Glued up ends

Credit: Moof





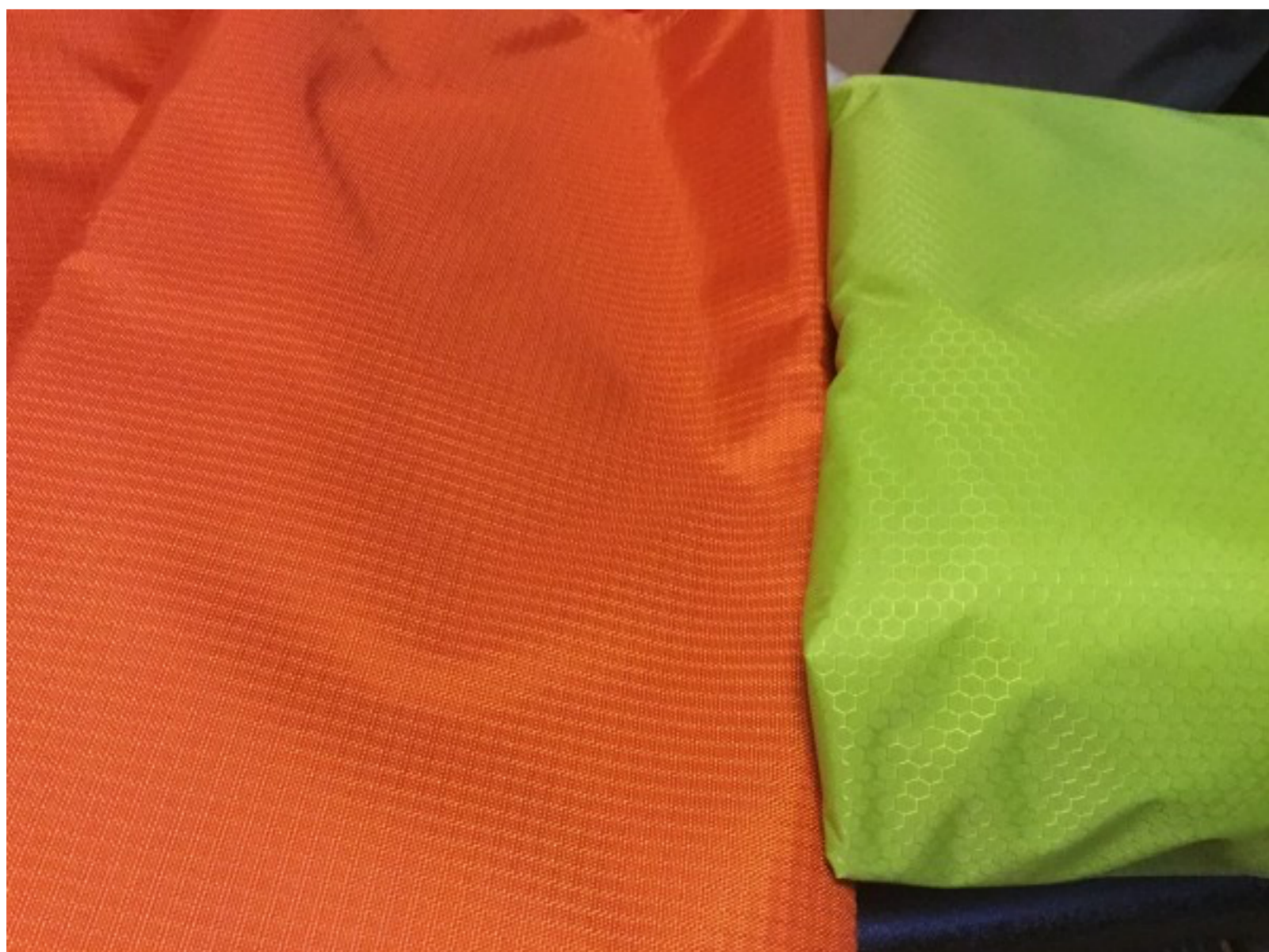
Glued up end joiners

Credit: Moof



Side tubes, waiting for double butt tubing to arrive. Haul bag is left over from a previous project, but perfect for this one.

Credit: Moof



Non-dyneema (cheap) 420d bed, and hex ripstop fly materials.





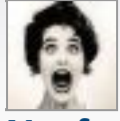
**BLUEBLOCR**

Social climber  
joshua tree

Apr 9, 2017 - 06:50pm PT

NICE Moof!

On those glued up ends, looks like you got female receptors waiting for male tube insertions?!  
I was jus wondering how might a male stub(maybe an inch long) would be comparably in strength, and set-up?



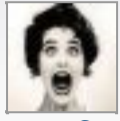
**Moof**

Big Wall climber  
Orygun

Apr 9, 2017 - 07:08pm PT

These corners were originally made for carbon fiber tubes, and I was paranoid about the ends splintering/crushing after abuse, so the recepticle is a full 1.5" deep, about 1/8" wall thickness. It should provide some of the rigidity Duece is getting from his curved corners. I have my corners on the end tubes instead of the side tubes, cuz I always have to learn the hard way... We'll see how that works out shortly, but it is how my carbon ledge is set up.

I honestly don't know whether male or female corners ultimately hold the best strength/rigidity/weight optimization. It is something I have pondered a few times to no avail.



**Moof**

Big Wall climber  
Orygun

Apr 9, 2017 - 07:34pm PT

Loks like the fabric place sent me 2x the fly material. The roll was alarmingly heavy, but it looks like they sent me 12 yards instead of 12 half yard like I ordered. Bonus! Not sure what to use it for however.

I am planning to see if I can't add some pockets INSIDE the center fin between the two layers (mine is a 2 strap with a catenary in between, fabric weeve on the 45 for better force spreading). Need some place to stash crap, you know?



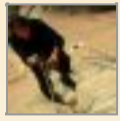
**WBraun**

climber

Apr 9, 2017 - 08:00pm PT

Looks good Moof.

With your new portaledge and your new valley giants you'll be the bomb .....



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Apr 9, 2017 - 08:52pm PT

Nice, Moof.

Another trick for tube cutting I recently rediscovered is using a step drill to do the initial deburring after using the tube cutter.

Just something like this--has the right taper, gets a nice initial inside debur.



Step drill for tube deburring

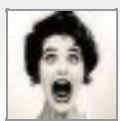
Credit: deuce4

Of course having a regular deburrer is key as well:



Credit: deuce4

What kind of glue are you using for the aluminum? I have some concern about the expansion/contraction in colder temps, but would be interested in hearing more about gluing vs. riveting.



Apr 10, 2017 - 06:40am PT

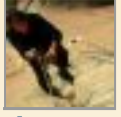
Same Hysol 9340 I had leftover from my carbon fiber project, been storing it in the freezer. A aircraft home builder recommended it some years back. For gluing up Al to Al the TCE mismatch is essentially zero.



Moof

Big Wall climber  
Orygun

I'll have to get a proper deburr tool, I have been just carefully using a utility knife. No bueno. Never thought to use one of those step drills!



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Apr 10, 2017 - 02:26pm PT

Slow speed is the key for the step drill, no more than 500rpm. There are speciality tools for chamfer and deburring tube edges, but very expensive. Step drills are cheap and readily disposable when they get blunt.

For a non specialty tool system for the outside edges of tubes that get inserted into another tube in the design, I use a belt sander and hold the tubes while spinning them and change the angle to get a nice rounded edge. Then about a minute or two steel wool polish by hand.

Having an air blower, even just a can of compressed air, is also a key tool for making frames, as even the most invisible spec of aluminum shaving can cause problems in the joints. Or you could use some sort of cloth to push all the way through the tubes to ensure fully clean.



BLUEBLOCR

Social climber  
joshua tree

Apr 10, 2017 - 03:03pm PT

Moof 🙌👍



Moof

Big Wall climber  
Orygun

Apr 10, 2017 - 04:54pm PT

Werner,

Goal is to be the best dressed Toprope Tough Guy in the valley!

I should drag my junk show up Royal Arches and get the first 8 day ascent. Unless Chongo already beat me to it?

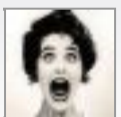
[\[Click to View YouTube Video\]](#)

Edit: Hey, the narrator at 0:12 looks awfully similarly to my actual partner...



Weather...

Credit: Moof



Moof

Big Wall climber  
Orygun

Apr 11, 2017 - 04:45pm PT

As previously stated, I have to do things the hard way, and can't always let myself learn wisdom for others until I have thrashed through the briar patch myself.

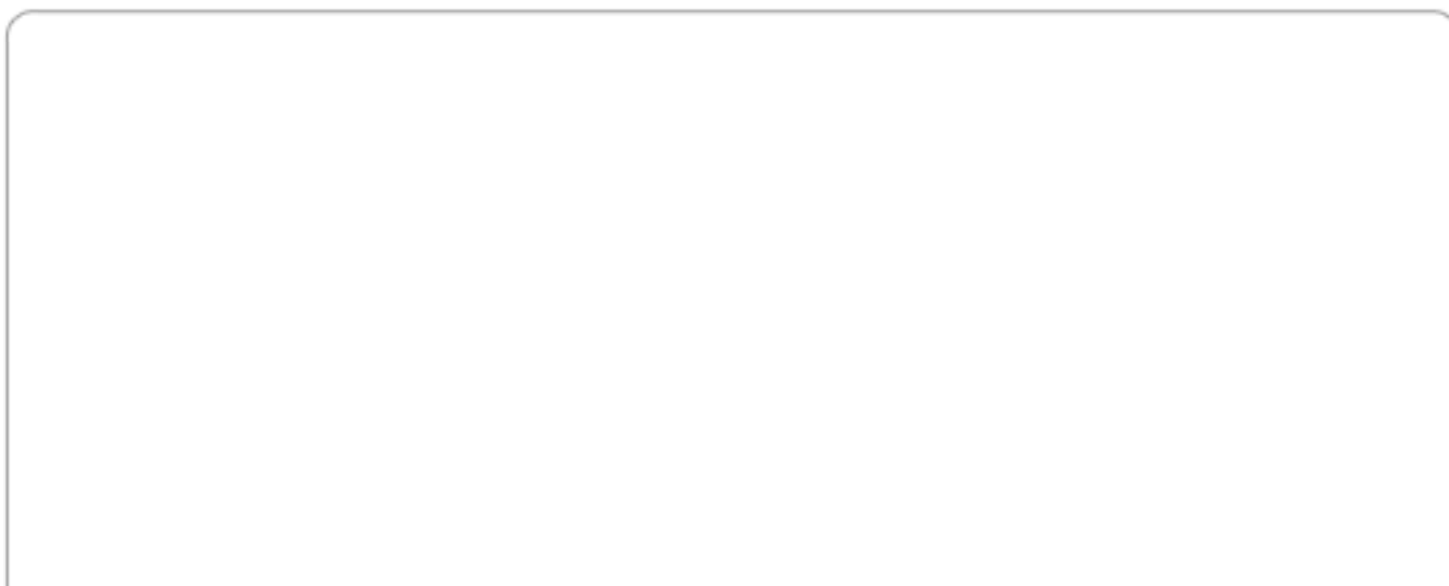
So back to suspension fins, and catenaries. I can't quite let that one go yet.

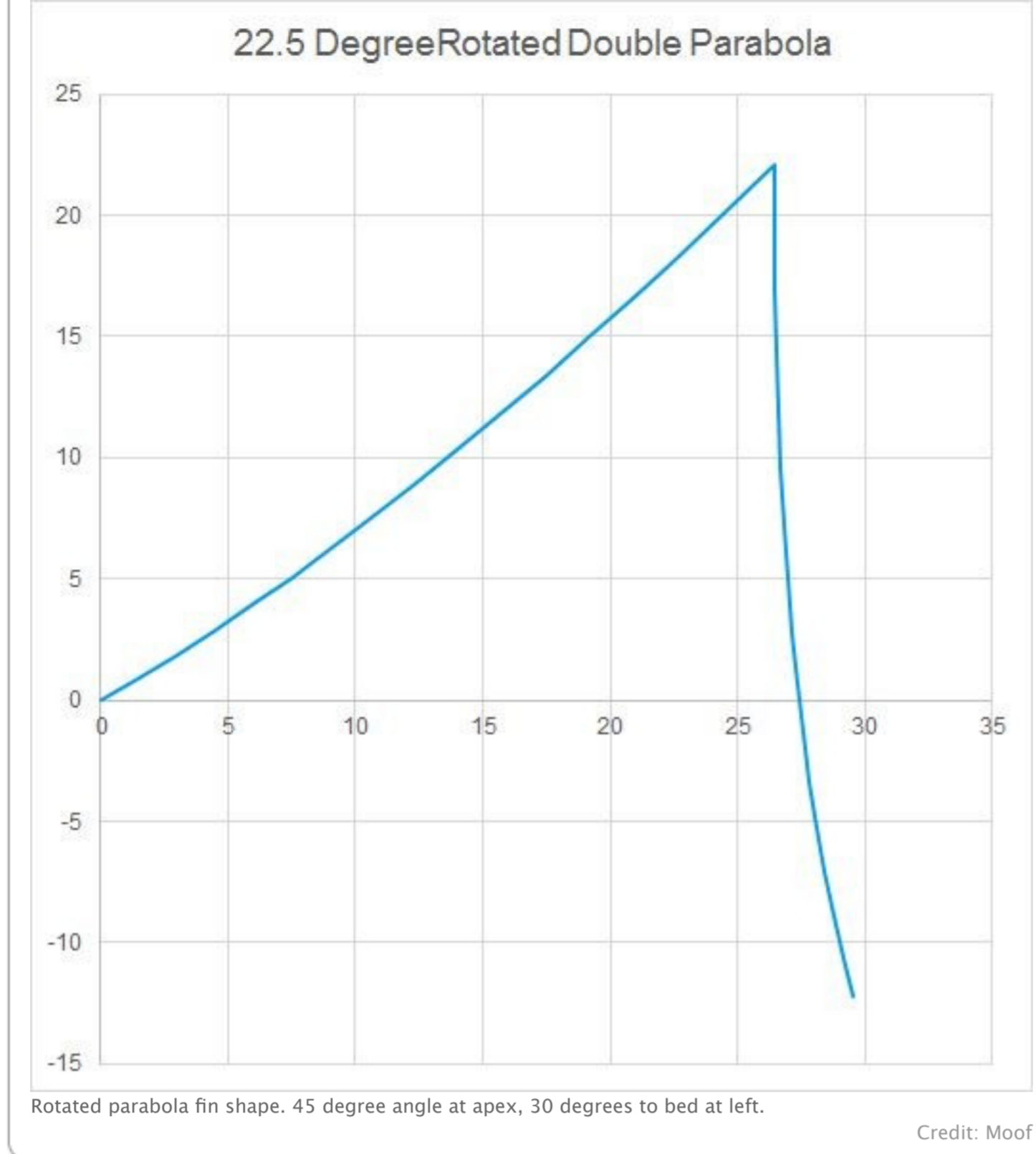
Guess what? Mistake #1 before I got re-started.

Not a catenary! Using the webbing for the suspension fin is akin to a suspension bridge, with equal loading per unit horizontal length. A catenary is the shape for equal weight per linear unit along the length of the curve (i.e. natural curve of a chain vs. Golden Gate bridge).

So the correct shape to start with is a parabola. Who knew?!

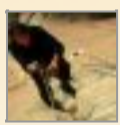
Next, the loading is at ~22.5 degrees to the bed, so really you have 2 back to back parabolas that are then rotated by 22.5 degrees to make everything make sense, so you get an ideal fin shape for equal weight distribution along the length of the bed like this (part below 0 would be trimmed off):





Actually getting the suspension bridge effect requires the weave to be rotated by 22.5 degree when cutting the shape. As Duece noted, actually getting webbing to follow the shape is a different story, but I had to finish scratching the itch from a couple weeks back.

Next up: My center fin will really be an overlapped cable stayed bridge prototype, not a catenary or parabola. Stay tuned...



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Apr 13, 2017 - 10:46pm PT

Looks really nice, Moof. Are you going for fin supports for your ledge?

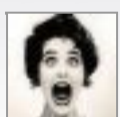


**hobo\_dan**

Social climber  
Minnesota

Apr 14, 2017 - 05:07am PT

In my last year of teaching I've been asked to do a basic course in Physics-- not certified for it, but riding a variance. John, I'm enjoying the technical arguments and your basis for design change-- you do a nice job of zeroing in on the parts of the equations that matter--Your discussion on tube length was well done. This is great nerd entertainment.



**Moof**

Big Wall climber  
Orygun

Apr 14, 2017 - 02:30pm PT

Duece,

Yep, I am planning on shamelessly being inspired by your D4 design and use 4 side fins, but I am adding my own flair and quirks along the way rather than a full-on knock off. I have more fun being inspired rather than copying. Hence it is a Hobby Ledge, not anything beyond.

Your much earlier post for the block corner design sketch was my inspiration and starting point. I re-calculated everything based on my own existing corners, and the desire to put those on the end poles instead of on the side poles. I use 4" of pole overlap on the side poles, and 6" end joiners (3" overlap). Putting the corners on the ends allows for a large overlap, as long as I can get the side poles into the corners). Swapping the corners around lets me use two 7' pieces of bungee cord instead of 22' of bungee for a small weight savings, just stopper knots in the corners needed.

A few things on Hobby Ledge different, like a 8:1 bed tensioner using a zig-zagged piece of 3/4" thin webbing through D-rings. I am excessively obsessed with spreading tension out and other pedantic details (my inner engineer is mad about how much my inner perfectionist is missing the forest for the trees).

I am also only putting the tensioner at one end. The end tubes will stay inside the fabric tube on the other and just get folded up. I am just about done with sewing the tensioner end of the bed and will post pics soon. I am only getting 1-2 hours every 2-3 days to work on this project.

Side pole internal double butting got all glued up last night. It was shocking how much the dry fit internal reinforcement stiffened up the side pole flex, bravo sir! I was able to play with a nice A/B comparison, and wow does it work as advertised. I manged not to order 1"x0.058" material for the 4 bits of corner double butting, which is a bummer, since otherwise the frame is now done. Argh. I hate wasting money on even more shipping.

More updates and pics will show up this weekend when I should be able to get 4-5 hours during kiddo's nap times. I am likely not to finish my fly in time for our May trip, but I have an ACE and 2 A5 flies that should fit fine, but I'd rather use my own if I can.





deuce4

climber  
Hobart, Australia

Topic Author's Reply - Apr 19, 2017 - 05:14pm PT

First Video Review!

<https://www.instagram.com/p/BTDM1heloNr/>

Thanks Acro John!

he also writes:

The main points that stood out for me were:

1. Super small size and weight packed w/ fly
2. how the long sides almost pop together on their own, and the way you put end pole stows so they don't just flop around.
3. The ridiculously easy connection of end poles.
4. The 4 part suspension. Quick and stable!
5. The haul bag side zipper with interior pocket for pole... this just blew me away! I had Rebecca get it out and she has never set up a ledge before, and watching how she was able to intuitively unzip and take it out was awesome! No other major ledge out there right now sets up with such ease.



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Apr 22, 2017 - 03:19am PT

Perhaps this link is better!

<https://www.facebook.com/bigwallgear/videos/427919084252091>



'Pass the Pitons' Pete

Big Wall climber  
like Ontario,  
Canada, eh?

Apr 22, 2017 - 04:53am PT

^^ Is that "my" prototype, John?

*"and watching how she was able to intuitively unzip and take it out was awesome!"*

There has never been anything "intuitive" about setting up a portaledge! It has always been a perplexing struggle .... at least up until now. ;)



walmongr

Big Wall climber  
Mesa AZ

Apr 22, 2017 - 08:32am PT

I rented an A5 double from Babbitt's in Flagstaff in the mid 90's, for our first wall (prodigal sun). We came back from that trip and bought one! Still have it and use it to this day I am sure this new one will be awesome with 20 some years of material advancement can't wait!!!



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Apr 22, 2017 - 11:34am PT

Yep, Pete, that's the one (prototype #3) earmarked for you, same one I used on Ozymandias last month. Still has an older version of the fly, though, good material and bomber, but we've since refined the pattern and added the door.

I just sent another demo (prototype #2, which was used in the Tarkine tree protests) to the USA with a friend who is heading to Zion, and I plan to match that one with a new fly as i hacked up its original fly as I am wont to do when I am in a creative mode (when I reinvented the Portaledge door system), and ideally we will try to get you a new fly with the door too, but right now we are also getting a few prototypes out the door for Twid Turner (proto#4) and Mike Libeck (proto #6 and #7) for their upcoming expeditions (plus we sent Marek who is still in Baffin a new fly last month).

Getting poised for our Kickstarter production...



Tom

Big Wall climber  
San Luis Obispo CA

Apr 22, 2017 - 07:57pm PT

It's always nice to see that people are trying new things, and are not dependent on the big companies to decide how things are done.

PTPP's comment above about making sure the suspension straps are long enough is very germane. Sometimes, you will want to hang the ledge out from the wall, and not against it. For me, that was always the best configuration, because having my feet to the wall, and my head out in space, gave me the best view of the moonlit wall.



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Apr 23, 2017 - 01:07am PT

Pretty much all innovations come from the small companies, Think Bibler tent, small cams, lightweight packs, the list goes on.

Big companies revise and refine others' ideas, in general. They're too busy looking what the other companies are doing to truly innovate.



nah000

climber  
no/w/here

Apr 23, 2017 - 01:24am PT

^^^

they don't call it the bleeding edge for nothing...

that said two significant exceptions that come to mind are petzl and arc'teryx...

so not entirely a rule either.



'Pass the Pitons' Pete

Apr 23, 2017 - 07:12pm PT

Thanks, John!

Here's Tom on Excalibur as he describes above:

## Pitons' Pete

Big Wall climber  
like Ontario,  
Canada, eh?

[Click to View Linked Image]

Pouring coffee from Dr. Piton's Shagadelic Big Wall Coffee Press.

Note array of Valley Giants on the right – the originals, tried and tested.

So have a look at Tom's ledge. He made this ledge, for our ascent of Excalibur, along with all the Valley Giants. They all worked.

Tom's ledge is an extreme example of what I call an "asymmetric hang". While Tom's ledge is cantilevered outwards, this same type of hang happens typically when belay bolts are too close together. Imagine Tom's ledge rotated plus 90 degrees, so the long side is against the wall as per usual. You want your ledge and your pigs side by side, but the horizontal array of anchors is too narrow.

Hence, you have to shorten up the straps on the inside against the pig, and lengthen out the straps on the outside.

Up until now, all ledges – except Fish – were totally inadequate at asymmetric hangs.

I pointed out this design flaw in ledges to Deucey, and made suggestions as to how to correct it so that the new D4 could hang asymmetrically, like Tom's.

Deucey's ledge design works, too.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply – Apr 23, 2017 – 07:41pm PT

Good idea--we might just do that. We save some weight with just one wall side but even when never set up against the wall, the air side can get beaten up over time, so that might be the go. That's feedback we also got from John V. (who recently used the D4 ledge on Zodiac and created our first video review!).

Keep the good feedback coming, but keep in mind that our objective is to keep the total weight even for the burly commercial versions less than mid seven kilo range max.



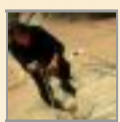
**BLUEBLOCR**

Social climber  
joshua tree

Apr 23, 2017 – 07:48pm PT

Great beta Pete, how about some more kissing pics;)

Please.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply – Apr 23, 2017 – 11:13pm PT

Hi Pete– Just saw your picture, for some reason it didn't come up when I last posted.

Cool picture. Did Tom ever try sleeping with the ledge in that configuration? I ask because I once designed a triangular folding ledge where the climbers slept head to wall and toes to air. But it didn't work well because there was an odd phenomena which I would call "wall side edge creep". I think because the center of balance is farther from the point of suspension (and I suppose the placement of the middle strap), the wall side tube would creep up though the night, in effect tilting the air side of the ledge down, which would get worse as it progressed. It didn't really happen with the one-person design, but somehow with two people shifting weight it would tend to happen more readily.

It was weird, it would set up fine, but over time would "wall side edge creep". I felt the problem could be solved by tweaking the placement of the suspension points, or perhaps going with a four-point suspension, but never really pursued it further after my design contract ended prematurely after 9/11.

Still curious about that one.



**'Pass the Pitons' Pete**

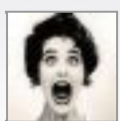
Big Wall climber  
like Ontario,  
Canada, eh?

Apr 24, 2017 – 09:34am PT

I think Blue is referring to the shagadelic Anita514....

Yes, Tom used to sleep in his ledge that way. I don't remember him tipping over forward, so somehow he addressed the Wall Side Creep.

Ha. Wall Side Creep has happened to me once or twice on my Fish ledge, when I clipped heavy bags of beer to the underside daisy on the air side of the ledge!



**Moof**

Big Wall climber  
Orygun

Apr 30, 2017 – 03:28pm PT

Hobby ledge is almost done, just needs webbing rash guard on the wall side D4 style 4 point suspension fins, and for the bungee cord to get put in.

Bed tensioning is an 8:1 with lots of spreading of tension along the width of the bed. The tension up on the ends of the ballistics is in-between the load spreading triangles, so in all the bed tension is spread across 9 point along the end of the bed, not just 3 as with the D4. I have had this design thought for several years, so it was nice to finally make it for real.

Poles are from Duece's hybrid diameter/thickness innovation, starting from his sharing of a block corner design with 10 piece hybrid poles. Mine are a re-calculated for 4" overlap, and shorter side poles due to placing the block corners on the short side instead of the side poles, but otherwise his design.

Center fin is a 2 point affair. The fabric weave is on a 45 angle such that the lines of tension are akin to two overlapping cable-stay bridge spans.

Overall it had a lot fewer foul ups than any of my usual projects. I had more of collision between the bed tensioners and the fin than is ideal, each got sketched out independently. Next time...

Jump-up-and-down testing is planned for after the kid's nap time.







Hobby ledge almost done.

Credit: Moof

Folding up and stowing works nice too. End poles break down and sit in the bed, then each end folds once more into the center so the whole thing can get rolled up in the straps.

Edit: Survives jump testing, and having the whole family pile into it. Pretty happy with how it turned out.

Edit 2: Added much needed attributions. Thanks for the cool ideas and inspiration Duece!



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - May 1, 2017 - 11:06am PT

Looks cool.

Hey Moof, I'd like to ask that if you use some of my D4 innovations, if you could reference them. I see in this case you are going for the 4/8 equalising suspension fins--it would be great if you could just add a note when you show the design that the fins are an original D4 concept.

I do like the fact that better ledges are getting created (that's always been my goal), though I do cringe when a company uses my ideas wholesale and neglects to reference the source--in other words, just because I am sharing the ideas does not mean that I approve their use without reference. Kind of like a scientific paper, rather than a patent, I suppose, with the goal to advance climbing endeavors.



**Moof**

Big Wall climber  
Orygun

May 1, 2017 - 12:12pm PT

Attribution added. I have ZERO intent of doing anything commercial, but just the same you are absolutely right that your ideas and inventions should be marked as such. My 3 main tweaks/changes are the 2 point center fin, parabola cut of the D4 4 point fins, and the mechanical advantage bed tensioning system.

By the way, I used 2 layers of center fin material (36" square folded on the diagonal). I sewed them together at the strap, and the bottom 6". The result is 3 openings into the center cavity where headlamps, hats, and other trinkets can get stowed at night. On the ground with the family piled in I found it easy to get my hand in, and stuff stays where you shove it.

Real testing happens in just over 2 weeks when we throw ourselves at NA Wall.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - May 1, 2017 - 03:05pm PT

Cool idea on the stow pockets, Moof. People are always asking for cup holders and stuff, and I cringe whenever having to add weight for convenience as survival trumps in my book, and light is right for survival.

But I have also been looking for a way to stow the center support fin straps when setting up and taking down the ledge, as I find it much easier if these are fully disconnected from the suspension, but then they dangle around--since they are just straps with nothing on the ends, they don't get tangled or anything, but they are a distraction, especially when windy.

Mind if we use this concept? Based on your idea of hollow shark fins, I initially envision just a seam taped slit big enough to reach a hand into. I'll make a proto later today. Have to think about strength aspect...

By the way, the reason I believe very important to either have no fin or a detachable fin in the center of the ledge (as in the current D4) is for when cooking with a hanging stove--you really don't want any fabric anywhere near a stove, of course. Important for expedition portaledges.



**Moof**

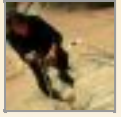
Big Wall climber  
Orygun

May 1, 2017 - 04:15pm PT

Go for it, copy anything you want. I took a 36"x36" square, folded it on the diagonal, removed a ~13" radius pie wedge from the apex, and seam taped the perimeter (I hate seam tape by the way...). The strap is detachable, for the reasons you state, but also you want to be able to fully drop the fin when not sleeping period. I have it sandwiched inside the two layers and sewn with a big box-X. You could add an elastic loop on the base of the fin strap to tuck a folded up strap into for almost no weight if you wanted, but I personally think letting it fly is just fine.

I don't sew mine into a bed-taco like you are doing, just 1" thin webbing on the back as reinforcement, and sew the fin onto the bed (has seam tape on the fin fold too). I'll probably die.

Topic Author's Reply - May 1, 2017 - 06:15pm PT



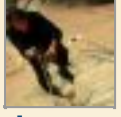
deuce4

climber  
Hobart, Australia

yer gonna die!

no, looks ok, as the shark fins aren't really supporting the ledge.

Actually, turns out Barry has a idea from one of his other products we might try first for the cup/holder/stash pocket. Seems cool the way you are doing it, though! Also would like to hear more about your bed tensioner system-- something different than the ubiquitous A5 tensioner system! Wondering if you could post a video of setup. cheers



deuce4

climber  
Hobart, Australia

Topic Author's Reply - May 2, 2017 - 11:01pm PT

New setup system for the D4 Portaledge.  
[\[Click to View YouTube Video\]](#)

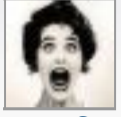


John Mac

Trad climber  
Breckenridge, CO

May 3, 2017 - 07:50am PT

It just keeps on getting better...



Moof

Big Wall climber  
Orygun

May 3, 2017 - 10:43am PT

Duece,

I'll try and get a setup video this weekend, probably no sooner than Sunday. I am scrambling to get ready for a trip in 2 weeks (!) among other life craziness, so no promises. I'll have to figure out that whole uploading to youtube thing from my phone.

I am glad I scratched the itch on the bed tensioner, probably not worth the extra effort/weight but it has been gnawing at me for probably 5+ years. I have always cringed at how much weight is being held by the center plastic buckle(s) on your designs if a couple guys are stomping around at a belay, though you have not had any failures, nor have I heard of failures on BD Cabana's so it is likely unfounded. Reality is that most of the force is held by the short direction of the bed, not the long ways, but still, high tension on plastic buckles, eww.

One old bed I did a few years back used Metolius crash pad buckles that they sold as replacements, so no threading, just hook and cinch (yes, I tried to optimize the hell out of 10 seconds a day on the wall, talk about local sub-optimization). I'll take pics of that shortly, it was another idea that was far better in my head than reality.

There is a lot of friction in my scheme, so you can't just cinch it up from one side, which is why I put buckles on both sides. Using the strand that is one zig-zag in to yard against makes it cinch up evenly. It is actually easy to get too much tension, which makes the bed taco like crazy (first world problem?). I don't like how the buckles in the corner pucker up the ballistics in funny ways, as they are being pulled inwards with nothing to counter-act, so I plan on doing some rework to tweak things a little bit.

If I did it again I would not use the load spreading pie-wedges, but just zig-zagged 3/4" webbing to the same effect with less labor/weight, and less interference with my center fin.

Overall I do like having the tensioner on one end only. Of course, the geometry only works out in my favor because of the corner blocks which makes for nice 25.5" end pieces when broken in half, while your design needs the end poles to be freed up to fold up so nicely since end pole only have to be ~30" in total. If I ordered a pipe bender my wife would probably kick me out of the house, so corner blocks it is for me.



deuce4

climber  
Hobart, Australia

Topic Author's Reply - May 3, 2017 - 02:41pm PT

Moof, really like the way you are trying new things and evolving your design---super cool. Fun stuff!

We are making a lot of significant improvements to the D4 this month, some really innovative aspects of the fly are upcoming; once the dust settles, I will share them as well.



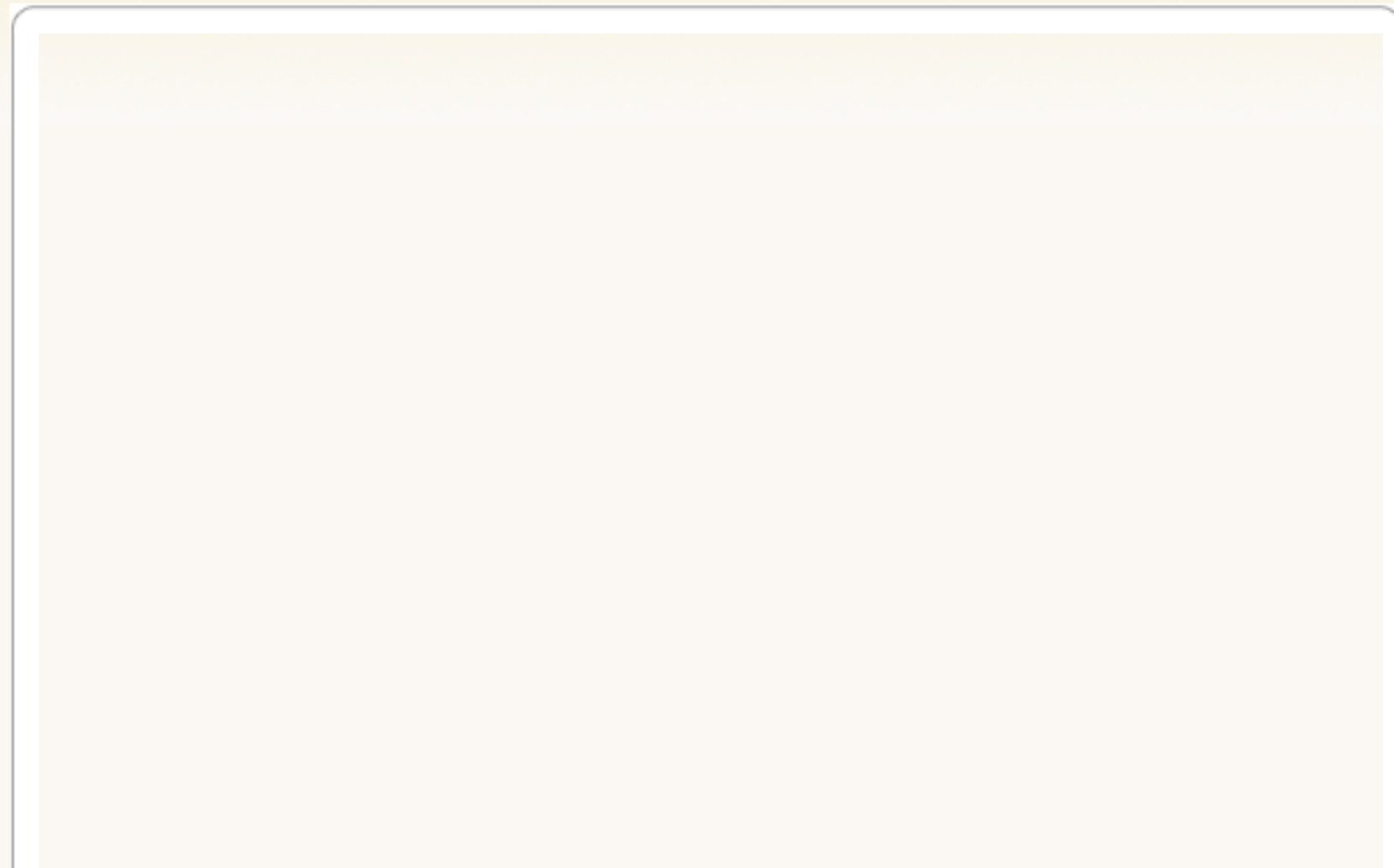
deuce4

climber  
Hobart, Australia

Topic Author's Reply - May 21, 2017 - 03:20am PT

Kickstarter Update 8:

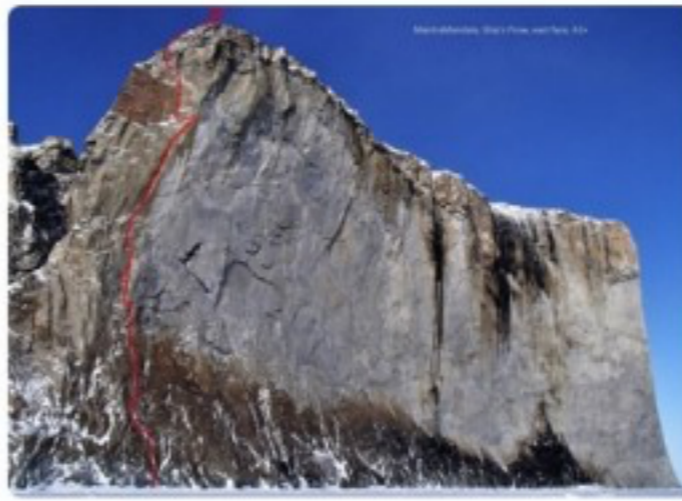
<http://mailchi.mp/46afa05c22b3/d4-portaledge-kickstarter-update-8?e=5ce0af98cb>





**Regan's two new Baffin routes with the D4 Prototype #1 Ledge**

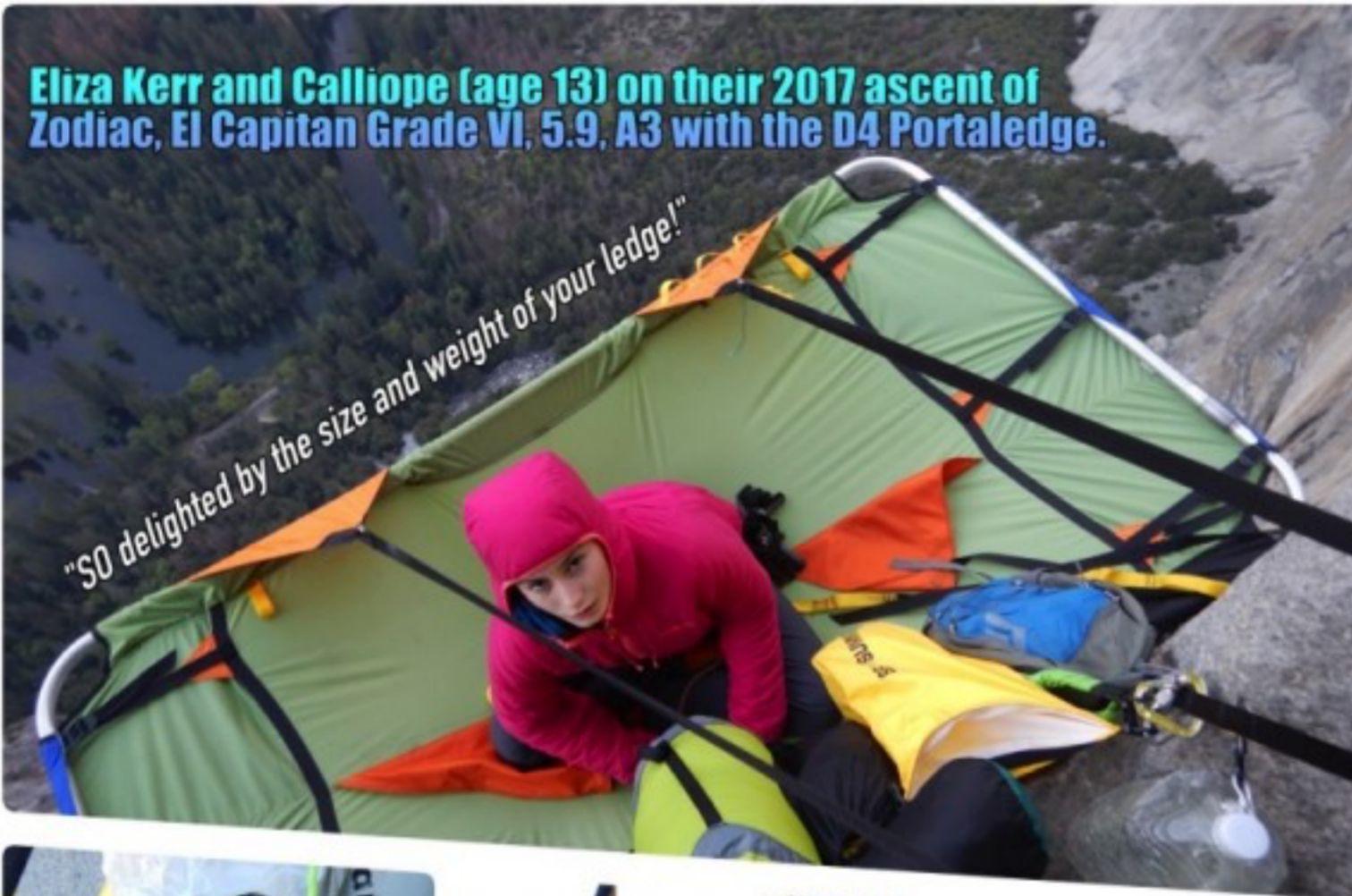
*"The new D4 ledge is great!  
No question it is something new  
and better. Lightweight is the key!"*



Credit: deuce4

**Eliza Kerr and Calliope (age 13) on their 2017 ascent of Zodiac, El Capitan Grade VI, 5.9, A3 with the D4 Portaledge.**

*"SO delighted by the size and weight of your ledge!"*



Credit: deuce4





The "Cape", D4's new patent pending portaledge fly design, with many new features.

Credit: deuce4



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - May 21, 2017 - 02:56pm PT

Better link for update 8: <https://www.kickstarter.com/projects/1188459201/the-d4-portaledge/posts/1887316>



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - May 23, 2017 - 03:15pm PT

Any comments/ideas/initial impressions?

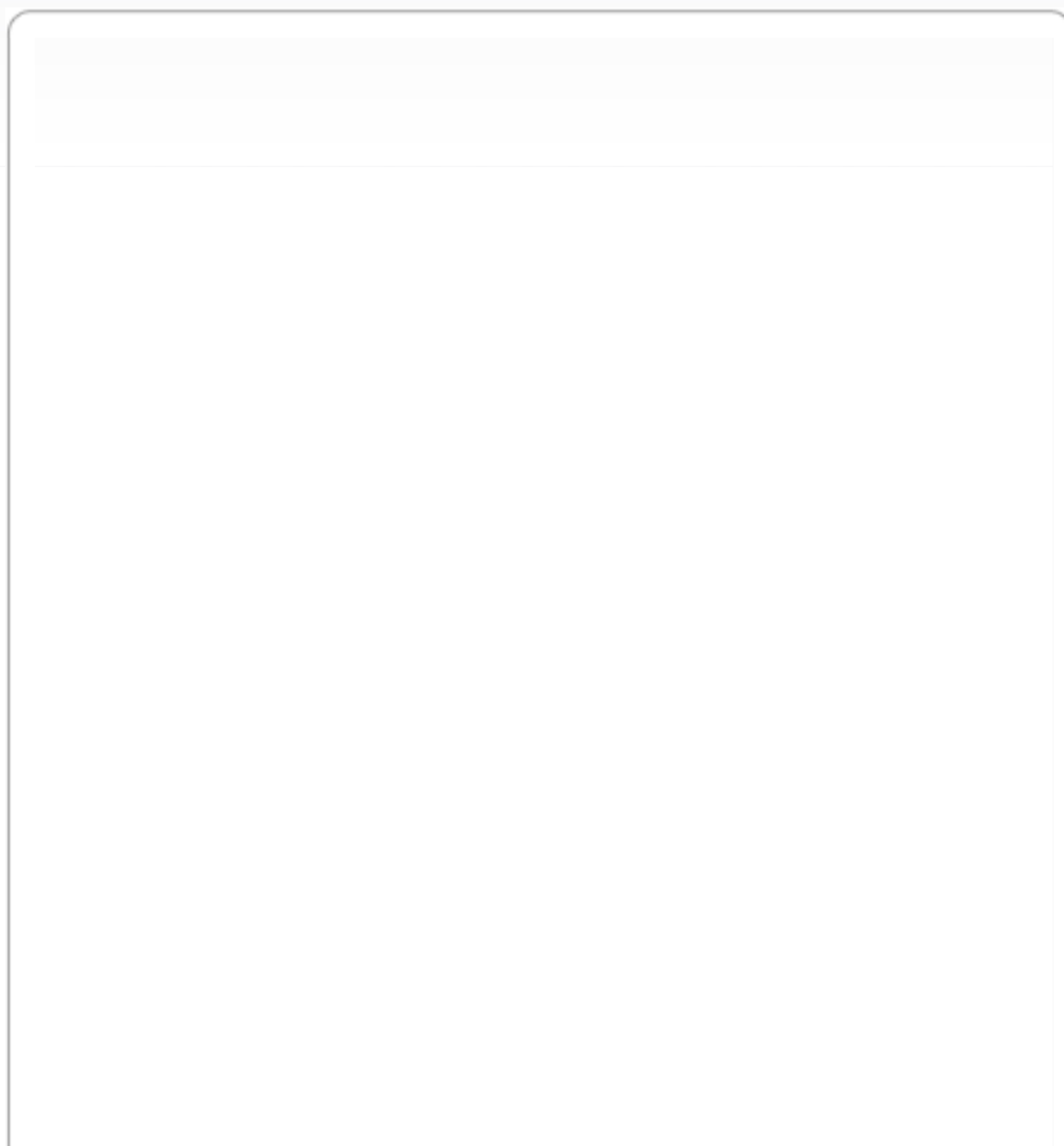


**Moof**

Big Wall climber  
Orygun

May 23, 2017 - 05:23pm PT

One of your Facebook pictures shows some sort of funky connector on the end of one of the end poles. What sort of voodoo is going on there? I am intrigued. Does it slide and lock to make getting the last pole into place more easy?







From Duece's Facebook teaser pics

Credit: Moof

Regarding the fly, looks very nice. I have a little bit of a hard time getting excited however, as I've only had to deploy a ledge fly 3 nights on a about a dozen walls (and one of those was just for bivying at the top where I would have been OK in just a bivy sack). If my needs were more expedition oriented I'd be all over it, but for most Yosemite applications I want a fly for insurance with the minimum of frills beyond not dying in a storm, so the extra zipper, while way cool, feels a little counter to the notion of simplicity and lightweight design you originally set forth for this project.

I am in the minority, however. BD even stopped selling their "Simple" fly, and only sells their "Expedition" one with the two doors and fully enclosed design. I am guessing it was due to low sales of the no-frills version I think most buyers default to clicking every option box and don't equate the extra crap with extra weight/volume.

Jim, the bend is the by-product of the 4 point suspension. If the suspension triangles were further out, and the camera level with the ground it would indeed bend downward, bring them close in and the cantilevered ends would further make the center bow upwards.



**deuce4**

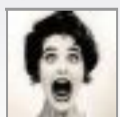
climber  
Hobart, Australia

Topic Author's Reply - May 23, 2017 - 05:32pm PT

Moof, for my original D4 frame design, I included a little plastic tube "helper" so the end tubes stay in place during assembly even when not fully inserted. For the prototypes, this was simply a short section of vinyl tubing, which I was concerned about in cold weather, but Marek Regonowicz used it up in Baffin in -60F temps, and loved the way it helped assembly. He found full deployment even with our first generation fly less than 10 minutes, solo, sometimes in tricky situations.

I am not sure I need the helpers anymore with my [latest frame system](#), but it helps with the "traditional" system with dangling end poles.

Regarding the camber of the ledge, there is a little flex when loaded, that is what you are seeing. Probably the camera makes it look more--the flex is very minimal with the new D4 hybrid diameter frame design.



**Moof**

Big Wall climber  
Orygun

May 23, 2017 - 05:45pm PT

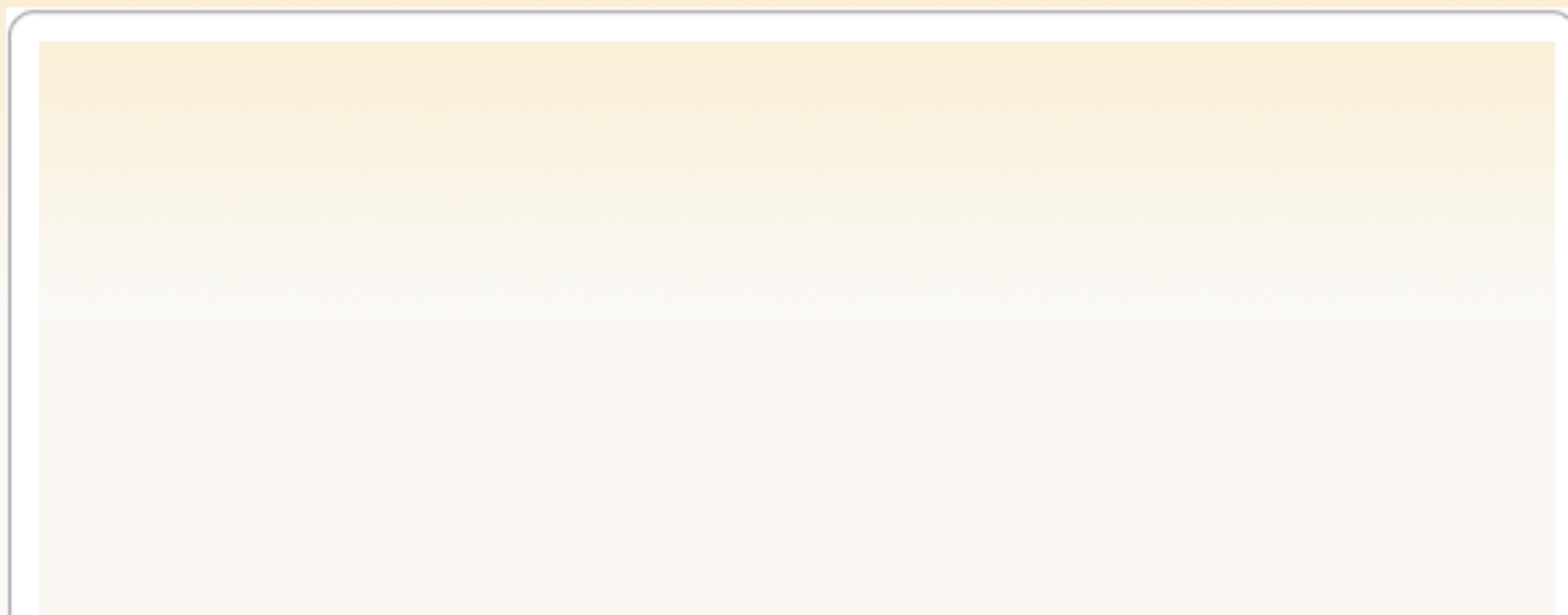
Got it, I missed the switch to non-dangling poles. I watch the videos with the sound off, so I missed that glaring detail when I watched the video.



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Jun 3, 2017 - 02:31pm PT







Barr Ward and Steve Quinlan with latest D4 portaledge and new custom variable angle test stand built by Steve. Photo John Middendorf June 3, 2017

Credit: deuce4



**WBraun**

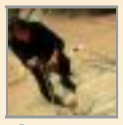
climber

Jun 3, 2017 - 03:32pm PT

Portaledge became obsolete today.

Honnold free soloed elcap in 4 hours earlier today.

Everyone must now do it that way ..... :-)



**deuce4**

climber  
Hobart, Australia

Topic Author's Reply - Jun 8, 2017 - 04:58pm PT

Not obsolete for this badass! Marek spent 30 nights in the D4 Portaledge soloing two new Grade VII's in Baffin this year.



D4 Portaledge demo #1 in Baffin Island

Credit: deuce4





Marek inside the D4

Credit: deuce4



D4 proto #1

Credit: deuce4



Deploying the fly right from the haulsack.

Credit: deuce4





Clint Cummins

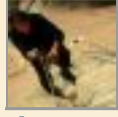
Trad climber  
SF Bay area, CA

*Portaledge became obsolete today.  
Honnold free soloed elcap in 4 hours earlier today.  
Everyone must now do it that way or no way ..... :-)*

[Click to View YouTube Video]

:-)

Kidding aside, great design and development work.



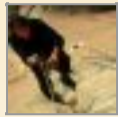
deuce4

climber  
Hobart, Australia

Topic Author's Reply - Jun 8, 2017 - 08:43pm PT

Latest setup video:

[Click to View YouTube Video]

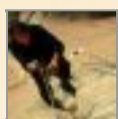


deuce4

climber  
Hobart, Australia

Topic Author's Reply - Jul 2, 2017 - 05:17pm PT

D4 Kickstarter Update #9: <https://www.kickstarter.com/projects/1188459201/the-d4-portaledge/posts/1927580>



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Jul 8, 2017 - 02:27pm PT

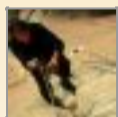
Here are all the all the updates in one set of links. It has been a fun and truly authentic design process, and now comes the hard work of production.

<http://us15.campaign-archive2.com/home/?u=ce43988cc561c943a5bb692c1&id=4aa7057d50>

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John Middendorf

<http://www.johnmiddendorf.net>



deuce4

climber  
Hobart, Australia

Topic Author's Reply - Jul 13, 2017 - 04:28pm PT

Setup manual (draft version, but explains the intricacies of the new lightweight system):

<http://www.deuce4.net/web/HowToD4Manual.pdf>

This thread seems dead, so all updates will now only be posted on the Facebook page:

<http://facebook.com/bigwallgear>



'Pass the Pitons' Pete

Big Wall climber  
like Ontario,  
Canada, eh?

Jul 26, 2017 - 08:51am PT

Resurrected from the dead:

**SIX STRAPS!!**

YAY!!

While the four-strap suspension seemed good "in theory", I was not a fan. It is prone to taco-ing, however if you follow John's instructional video to the letter, you will be ok.

Mostly I did not like it as a soloist, because with no person to counterweight the other end, I could not lean my back against a non-existent corner strap, nor against the pig, as a backrest. Thinking of El Cap, I like to sit with my back in the SW corner to face the morning sunlight. Impossible with four straps.

Also no good for me [being alone] with the four straps - when you go to load your pig in the morning, you want to stand on the end of the ledge to reach inside, right? Well, you can't do that, because with no person to counterweight it, it immediately tips!!

I found it harder to level, and to keep level. If you moved a bit, it would shift more than a six-strap ledge.

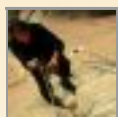
That being said, the other design innovations are brilliant! I really LOVE the round corners for flagging the ledge during hauling, because unlike a block corner, the round corner will slide round obstructions on the wall amazingly well. And since on a big nailup we haul two loads, with the ledge flagged on the second load, the ledge slides up past the first docked pig and catch lines much easier.

The way it folds in the bag is super-easy, and it is FABULOUS that you can pre-attach the fly for quick deploy. I used to use an old North Face-A5 fly with a floor, and that really IS Big Wall Theory, at least for above freezing walls. The bottom of the ledge fly would collect water, a giant cold lake heat sink. Yes, there are grommets, and no, they don't drain well.

Deucey - please provide links below where you want me to copy and paste this stuff for you. Like McTopo, etc, then message me and I'll update as you like.

Cheers, eh?

PtP Pete



deuce4

climber

Topic Author's Reply - Jan 1, 2018 - 05:54pm PT

Just finishing up the Kickstarter--we did it, completed all orders ahead of schedule!

Barry Ward of Durango Sewing Solutions will be continuing to produce the D4 portaledge.

Final Kickstarter update: <https://us15.campaign-archive.com/?u=ce43988cc561c943a5bb692c1&id=c2a26e4924>



All Kickstarter updates here: <https://us15.campaign-archive.com/home/?u=ce43988cc561c943a5bb692c1&id=4aa7057d50> (these fully document the evolution of the design during the Kickstarter).

In the meantime, check out the adventure of re-inventing the portaledge in pictures: [\[Click to View YouTube Video\]](#)

And a new interview on the history of portaledge development: <http://www.bigwalls.net/portaledgeHistory.html>

Also some stuff on the D4 portaledge in Chris K interview here: <https://enormocast.com/episode-142-john-middendorf-built-it-and-they-will-go/>



**hooblie**

climber  
from out where the  
anecdotes roam

Mar 9, 2018 - 10:19am PT

**bumping the good stuff**

Messages 1 - 265 of total 265 in this topic

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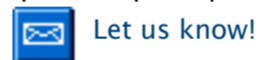
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