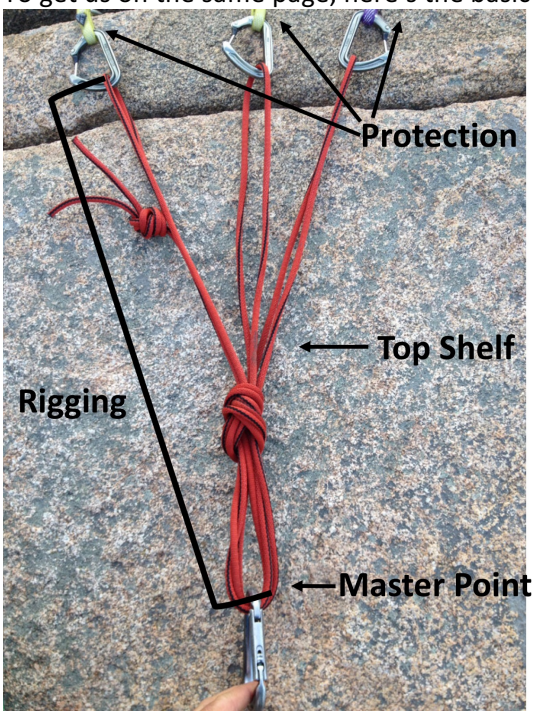
Building Climbing Anchors: Basic Principles

This guide is meant as a cheat sheet to help you remember the basic principles of building climbing anchors. It's not meant as complete guide to learning to build an anchor, it does not cover how to place gear, and it is in no way a substitute for learning from experienced climbers. Excellent books have been written about anchor building, and my recommendations are below. This is basically the checklist I go through in my head every time I build an anchor. Climb on! (Christine Lamanna, lamannaca@gmail.com)

Basic Anatomy:

To get us on the same page, here's the basic anatomy of three-point pre-equalized trad anchor.



A well-constructed anchor is **SERENE…**

S = SOLID. Each piece of protection in your anchor should be solid, well-placed, and able to hold a fall. What makes protection solid will depend on the type of pro (cam, nut, bolt, tree, boulder, etc.). You can also make each connection in your system solid by using locking carabiners, or two opposed non-lockers.

E = EQUALIZED. An anchor consists of one or more (usually more) pieces of protection, and in the strongest anchors, they all share the load **equally**. We achieve this with the way we rig (connect) the pieces in an anchor with slings or cordelettes (thin static rope).

> **Pre-equalized:** for known climbing/falling directions (most common scenario) we can rig the pieces together so that they will all equally hold a fall in the anticipated direction, typically by tying an overhand or figure 8 knot in the rigging material.
>
> **Self-equalizing**: for scenarios where the climber might move around (or you've rigged a top-rope for a few climbing lines), you might want the anchor to be able to equalize for several lines of fall. We usually accomplish this by rigging with a "Sliding X".

R = REDUNDANT. An anchor is the ultimate point of safety for a climbing team, therefore we try to make them redundant, meaning that if one element of your anchor fails, the anchor still holds. Ways to be redundant:

> **The Rock**: Are all of your pieces of protection using the same flake? What happens if the flake breaks? Try to use multiple locations for your protection to minimize risk.
>
> **The Pro**: Are you using multiple pieces of protection? What happens if one piece blows?
>
> **The Rigging**: What happens if the sling or cordelette connecting your pieces fails? This is especially important to consider in areas with a lot of potential rock fall, or if your rigging is in contact with a rock surface.

E = EFFICIENT. While you might be able to build an 8 point super-redundant fully-equalized masterpiece of an anchor, is that an efficient use of time and resources? If you're climbing multipitch you might want some of those pieces for the climb, and your belayer has probably already left you to go get a beer.

NE = NON-EXTENSIBLE. If one piece in your anchor fails, the rigging in your anchor will extend. By minimizing how far the rigging will extend in the event a piece blows, we can limit the shock loading of the rest of the anchor. We can accomplish this by typing stopper knots in the rigging of a self-equalizing anchor, or by using a pre-equalized anchor.

Some further considerations…

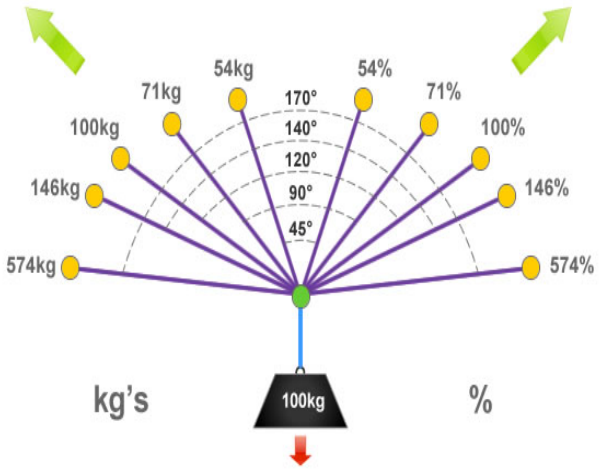
1,2,3: How many pieces of protection do I need? It depends on how bomber those pieces are. Here's a general rule of thumb, but remember, when in doubt, add another piece!

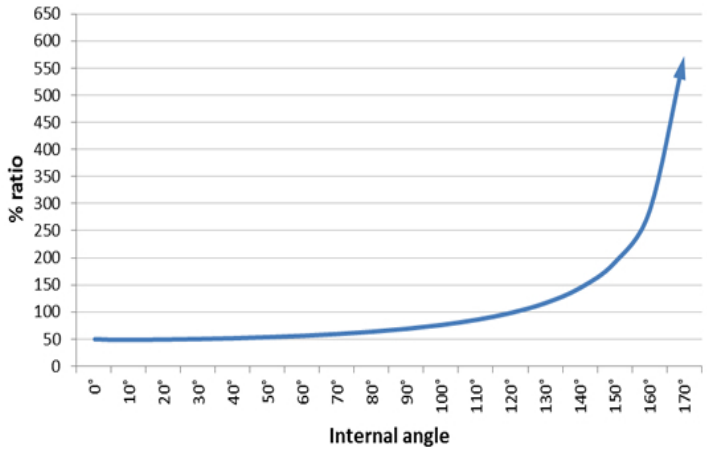
1: For incredibly solid natural protection, such as a big tree or a big boulder, you can generally get away with using only that one piece of protection.

2: When bolts are available for an anchor, two is generally sufficient. Always be sure to check the condition of the bolts though! If they are loose, wiggly, or corroded, consider using something else.

3: When placing your own protection, the general rule of thumb is that three solid pieces of pro make a solid anchor. If you don't think one of your pieces is solid, consider adding another.

ACUTE: The angle between the pieces of protection formed by the rigging can dramatically change the forces on each piece in the anchor. At an angle of 90°, the force on each piece is multiplied by 1.5. At 120° the force has doubled. Try to keep your rigging angles as acute as possible.





RUN FREE: Particularly for top rope anchors, the rope must run freely (e.g. not rub against sharp edges of rock, or rub along a slab). The friction of the weighted rope rubbing against rock could damage or even sever your rope. Always extend your anchor so that the rope runs as freely as possible, or if that's not possible, consider using a rope bag or other kind of padding to reduce abrasion on the rope.

Recommended Reading:

Rock Climbing Anchors: A Comprehensive Guide. Craig Luebben. 2007. The Mountaineers Books.
Mountaineering: The Freedom of the Hills. The Mountaineers. 8th Edition. 2010.
https://www.rei.com/learn/expert-advice/climbing-anchors.html