Anchor Building on Multi-Pitch Climbs

Anchors are a crucial and important piece of the multi-pitch technical system but they are still only one piece. A well-built anchor alone cannot fully protect you and your partner from the falling hazard on a climb. Anchors have to work within a system that includes belays, running protection and dynamic ropes to achieve the desired result. For instance a well-built anchor that is poorly located on a ledge at the belayer's feet does not allow the belayer to be situated in a way to hold the fall of a second or brace him or herself properly to hold a leader fall. This article does not attempt to fully explore the interface between the protection system, belaying and the anchor. The purpose of this article is to give you an insight as to how we teach the basics of multi-pitch anchors and give you a sample of the handouts we provide for our leader courses. The other subjects we cover in our lead courses that we have handouts for are; Belaying the Second, Belaying the Leader, Choosing the Right Length Sling, Placing Traditional Gear, The Dynamic Property of the Rope and Rappelling. To truly protect yourself on a multi-pitch climb you need to understand all these subjects and how they interact. We suggest that you learn these subjects and how they interact from a qualified guide who themselves have had training in using and teaching these systems. Having said that I hope you enjoy our multi-pitch anchor handout.

To build an appropriate anchor we first need to identify what functions the anchor needs to perform, there are three main functions anchors on multi-pitch climbs need to fulfill, they are:

1. Anchors need to hold the force of a leader fall should he or she fall prior to placing any protection. This fall, referred to as a Factor 2 fall and generates the highest forces the climbing system experiences in a typical climbing situation.

2. The anchor needs to keep the belayer from falling off his or her stance and help them situate themselves properly while they are belaying either the second or the leader.

3. The anchor needs to be able to handle the forces that are generated by a falling second.

Anchoring on a multi-pitch climb is made more difficult because it takes place at the end of a pitch when the leader has the least amount of equipment to build an anchor with. Although themes will repeat each anchor is unique and needs to be adapted to the terrain and circumstances there are being used in. Another thing to remember, in a party that is sharing leads you will always build the anchor that will hold you up should your partner make the mistake of taking a factor 2 fall. The bottom line here is that the anchor is your final line of protection and it can protect you from many of the mistakes your partner might make during their lead. For these reasons anchoring is a difficult yet crucial skill to develop.

It helps to have an analysis process that allows us to judge the strengths and weaknesses of an anchor in a particular situation. No anchor can be perfect therefore we need to know what aspect or function of the anchor is compromised and make appropriate decisions or where possible make adjustments in other parts of the climbing system to reduce the risks these compromises pose.

Below is an analysis method that uses an acronym that will help you remember it:

1. ***N****o* ***E****xtension*; if one of the pieces where to fail the anchor does not extend thereby keeping the belayer stationary. The movement of the belayer particularly if they are pulled off the belay ledge can severely compromise their ability to hold a factor 2 leader fall or a second fall depending on the belay method used.
2. ***R****edundancy*; is defined as, more than one thing would have to fail before the whole anchor can fail.
3. ***D****istributed*: if there is to be more than one piece then we want the force generated by a fall to be distributed amongst the pieces so we use the combined strength of those pieces rather than having one backing up the other. Another consideration with distribution is we do not want to somehow increase the overall force by having to large an angle within our anchor system.
4. ***S****implicity:* This looks at how quick the anchor is to build and breakdown and how uncomplicated it is so the climbers can quickly check key points.
5. ***S****trength:* The system, placements and materials that we use need to be of appropriate strength.

We call this the ***NERDSS*** analysis.

We must start by realizing that there are few if any perfect anchors. Our job is to make the best compromises given our situation. The techniques I will cover below are best described as a “system of anchoring”. This system will solve most problems you will run into on multi-pitch climbs. It is not exclusive, in other words there are many ways to anchor that are appropriate that we will not cover. The reason we will not cover them is to simplify the anchoring process and reduce duplication. This is the system I use daily in my work and recreation. I find this system to be versatile and I seldom need to stray from it.

Single Point Anchors

The single point anchor may seem like too large of a compromise in redundancy to be viable but in many areas it is one of the most common anchors. On crags that are in forested areas single trees are often used as anchors both on the cliff and at the top of the cliff.

Immediately we can see that a single point anchor cannot be redundant therefore we must be very comfortable with the single point if we are to use it as an anchor. As I mentioned above the most common single point anchor is a very stout tree. Other examples can be large boulders and large horns. All three need to be inspected carefully but horns and boulders seem to be the most common single point anchors that are misjudged.

Although the anchor itself may be a single point the sling or cord we use around these anchors can be made redundant, this is especially important with horns and boulders as they may have sharp sides that could cut the material we place around them.

There are three common ways climbers place sling or cord around these type of objects.

1. Girth Hitch **(Picture 1)**

2. Placing a loop around the object and clip the ends of that loop together with a carabiner. **(Picture 2)**

3. Place a loop around the object and tie the loops together with a Figure of 8 or Overhand Knot. **(Picture 3)**

Picture 1

Given that we are talking about a single point anchor a "no extension" analysis is moot. When we analyze the Girth Hitch for redundancy we ask, if the sling were to break or cut at any one spot would the whole system fail? We can quickly see that the Girth Hitch lacks redundancy. When analyzing distribution, again we have a moot point because we are talking about a single point. When we do a strength analysis of the Girth Hitch we can see that only two strands of the cord or sling hold the force **(Picture 1)**. This means that each strand of cord or sling needs to hold half the force that is placed on the anchor.

When we place a loop around the rock or tree and clip the ends of that loop together with a carabiner four strands hold the force we place on the anchor, which puts only ¼ the force on each strand **(Picture 2)**. This is a stronger arrangement then the Girth Hitch but this system too lacks redundancy because should any strand break or cut the whole system would fail.

Picture 2

Picture 3

When we place a loop around the object and tie the loops together with a Figure of 8 or Overhand Knot **(Picture 3)** again we have the strength of 4 strands but because we have tied a knot into the system we have weakened the tensile strength of the cord. However if any one strand were to break or cut the whole system does not fail. In other words this system is slightly weaker than the previous one but it is redundant.

Because the single-point anchor is naturally so simple, analyzing these anchors for simplicity is somewhat academic and although it is arguable that the cord that is tied takes somewhat longer the difference is marginal.

Given that the girth hitch has no real advantage over the other two systems and as we can see it is weaker than he other alternatives, its use as an anchoring system is limited and in most cases should not be employed.

Looking at the results of this analysis it appears that we have a choice between strength and redundancy. Given the quality and design of the cords and slings we use in climbing, strength in this situation (where the force is divided into quarters) is not a large concern. One thing we do need to be concerned about is the method that is used to join the ends of the sling or cord. These methods can range from factory stitching to any number of knots; the most common ones are the Water Knot for sling material and the Double

Fisherman's for cord. In a non-redundant system if these knots were tied incorrectly or became untied we would have an anchor failure. Other than the knots failing we are also concerned with the sling or cord cutting. This is of importance when the single point anchor is made of rock, either a large boulder or more likely a horn. For these reasons a redundant system has advantages. If a tree is too large to be able to tie the Figure of Eight in your cord or sling it is acceptable to use the non-redundant method. I would carefully check the junction knot as I mentioned above.

Two Point Anchors

These are the minimum gear (nuts, cams, pitons, bolts, etc.) anchors you should be using in multi-pitch 5 class climbing. Because they are the minimum they are also not the most common anchors you should be using. Still two point anchors are quite common where bolted anchors are popular. We will discuss three systems for two point anchors.

1. Crossed Sling **(Picture 4)**
2. Cordellette **(Picture 5)**
3. Direct tie in **(Picture 6)**

The Crossed Sling (Picture 4)

To tie the crossed sling, take an appropriate length sling and clip it into the two pieces. Pull down on the strand of the sling between the two pieces. Give this strand a twist and clip a locking carabiner into this twist and the other strand of the sling. You should check to make sure that the locking carabiner is clipped properly. If it is not, should one of the pieces fail the locking carabiner will slide off the end of the sling. This will cause the anchor to fail.

Picture 4

Picture 5

The Two-Point Cordellette Method (Picture 5)
Cordelettes are commonly 16 feet of 7mm perlon cord or 5.5mm Spectra cord but this method can also use sling material. To build the two-point cordellette style anchor you begin by proceeding much the same way as the crossed sling. First, you clip the cord into the pieces. You then pull down on the strand of the sling between the two pieces. Now instead of giving the strand a twist and clipping a carabiner into the two strands, grab the two strands and tie either a figure of eight or an overhand knot.

The Direct Tie In (Picture 6)
The direct tie in is done completely with the rope. First, tie a small overhand on a bight close to your harness. Next, measure from your stance to the lowest piece of your anchor. To do this, clip your rope into the lowest piece and stand at the stance. Pull the rope tight to you using the piece as a pulley. Grab the two strands going to the piece and walk your hands up this to the piece. Unclip the rope from the piece making sure not to lose the measurement. Add about 6 inches of rope to the measurement to accommodate the extra length the knot will take up. Now tie a figure of eight knot so that the loop of the knot is as long as the pieces are apart. Clip this knot into the first (lowest) piece. Take the backside rope from this knot and clove hitch it to the second

Picture 6

piece. Adjust this so that both pieces are weighted when you lean back against your anchor. Next undo the overhand on a bight you tied and tie another one as close to the figure of eight as you can. This overhand will be useful when belaying your second. Let's analyze these three methods using the NERDSS analysis. To analyze an anchor it is best to imagine yourself tied into and leaning back on the anchor.

The first anchor we will analyze is the crossed-sling. To find out if the crossed-sling anchor has No Extension we need to look at what happens if a piece were to fail. We can do this by marking the place we are standing when we lean back on the anchor. We can then remove a piece from the anchor. When we lean back again we can see if we have moved position. When we do this with the crossed-sling we do move and depending on the length of the sling it could be very substantial.

To determine redundancy we will look to find if there is any one thing that can break or cut that would cause the anchor to fail. The first thing you will notice is the rope, which is always the one thing we trust. The next thing you will notice is the locking carabiner. The use of a locking carabiner has become common practice in modern climbing but remember that this is a crucial connection and <u>it must be locked</u>!!! An option that is redundant and some climbers use are carabiners with their gates opposed.

Picture 7

To oppose carabiners, clip the carabiners so that one opens up and one opens down then spin one so that the gates are also on opposite sides. **(Picture 7)** The next non-redundant thing you will notice is the sling itself. The crossed-sling configuration is not redundant, if the sling were to break or get cut anywhere along its length the anchor would fail

To check the distribution of the forces we will move side to side or up and down while we are hanging on the anchor. Do the pieces stay weighted during this motion. With the crossed-sling the locking carabiner slides and the sling adjusts to keep the pieces weighted.

When we do a simplicity analysis we can see that if we can use a standard two-foot shoulder runner the crossed-sling method is very simple to set-up and breakdown.

Next is the strength of the crossed-sling system, we can see that each piece receives about ½ of the force but because we have 4 strands taking the force in the sling we are stressing the sling with only ¼ of the force.

So in our analysis of the crossed sling we find it will extend, it lacks redundancy, but it has a good distribution of forces, it is a simple and a strong system. The next analysis we will do is for the Cordellette. When we perform our extension test we find little or no movement of the belayer should a piece fail. We will find the same lack of redundancy here with the rope and the locking carabiner but when we look at the cord we find that at least two strands of the cord need to be cut or break for it to fail. When we do our distribution of force test we find that the cordellette anchor distributes the force for only a small range of movement. From a simplicity perspective the cordellette has to almost always be longer than a two-foot shoulder runner to accommodate the knot and because of that it is much more tedious to store once it has been broken down. Therefore although the cordellette method is pretty simple it is not as quick and clean as the crossed sling. Analyzing the strength we see that the cord has the same four strands as the crossed sling but now there is a knot. Given that knots generally weaken the material they are tied into we can surmise that the cordellette method is weaker than the crossed sling.

It is important to note here that as long as an appropriate width sling or diameter cord is used the strength of the material with a knot is well within the acceptable strength for climbing. The point here is that many confuse redundancy with strength and that is not always the case. A redundant system like the codellette may protect you from a poorly tied junction knot in the sling or cord or a manufactures defect in one spot of the material itself but it does not necessarily create a system that has a higher tensile strength.

When we do a NERDSS analysis on the direct tie in we find it similar to the cordellette in that it does not extend should a piece fail. As we check the direct tie in for redundancy we first notice that we have done away with the sling or cord we needed for the previous two anchor systems. We also will notice that we have done away with the locking carabiner. Because we have taken out the potential weak link of a cord or sling and the locking carabiner we consider the direct tie in to be a superior system from a redundancy perspective despite the fact we cannot technically call it redundant because we are using only one rope. When we check the direct tie in for its ability to distribute the force amongst the pieces we find it similar to the cordelette in that as we move side to side or up and down it distributes the force for only a small range of movement.

So we find that the direct tie in is similar to the cordellette in that it is redundant with no extension but does not distribute forces except in one direction. The biggest weakness of the direct tie in is how difficult and complicated it is to build correctly. As far as strength since we are using only the rope this is probably the strongest of the three systems.

Here is a chart so you can quickly compare the analysis between the three two-point anchors

	No Extension	**Redundancy**	**Distribution**	**Strength***	**Simplicity**
Crossed-Sling	**No**	**No**	**Yes**	**Good**	**Simplest**
Cordellette	**Yes**	**Yes**	**Limited**	**Probably Less Than the Crossed Sling**	**More Complicated**
Direct Tie In	**Yes**	**Yes**	**Limited**	**Excellent**	**Most Complicated**

* All three anchor systems are strong enough for multi-pitch climbing systems if the proper width or diameter cord or slings are used

How does this analysis help us in deciding which two point anchor system to use in various situations? Here are some explanations and examples that might help you make better decisions on the cliff. When you look at the chart above you will notice that the cordelette and the direct tie in are functionally identical. The major difference is between those two and the crossed sling. Where they differ is best described as a trade off between no extension and redundancy on one hand and a distribution of force and simplicity on the other.

For instance one concern with the crossed sling is when there is substantial difference between the strength of the pieces. If you were to use a crossed sling on an anchor with one poor bolt and one good bolt for example the extension can become an issue. If this extension causes the belayer to lose their stance it may have a detrimental effect on the belayer's ability to catch any fall particularly a factor 2 fall

On the other hand where there are two pieces of the same quality particularly if the two are somewhat suspect such as two equivalent older bolts the more we can utilize the combined strength of the two the better off we may be. This always has to be tempered with the idea of the potential extension that could happen should one of the pieces be weaker than we thought. But if the two pieces are new good quality bolts the chances that either would fail is very slim and now the advantage may go to the simplest and quickest method.

There are times when the simplicity of the crossed sling becomes a factor. For instance, on a longer route with good bolted anchors the crossed sling has a distinct advantage. In this case the crossed sling can be used to help increase the speed of the party without a large compromise in their security.

The crossed sling and the cordelette have a feature the direct tie does not have. They both have a common point where more than one person can clip into the anchor. This can come in handy if the same person is doing all the leading. For this reason these two anchors are popular with guides. This feature can be an asset with groups of three as well, but as long as the climbers at each end of the group of three are sharing leads the middle person can use the overhand on a bight as their anchor point when using the direct tie in.

So now the question arises, why would you ever use the direct tie in? Once someone learns how to build the direct tie in quickly and efficiently you can minimize the weakness it has in simplicity and create an anchor that requires no extra equipment. This can have importance on alpine rock climbs where the party carries as little equipment as possible or when a leader climbs a long complicated pitch and is running out of equipment to build the anchor or when a leader forgets to take the cordellette from their partner on the previous pitch.

Three-Point Anchors

Three-point anchors are the most common gear anchors and are mainly variations and combinations of the two point anchors you already know. We will cover three types of three-point anchor systems they are:

1. Three Point Cordellette **(Picture 8)**
2. Two Point Cordellette/Crossed Sling Combination **(Picture 9)**
3. Two Point Direct Tie In/Crossed Sling Combination **(Picture 10)**

Three-Point Cordellette

The first system we will cover is the three-point variation of the cordellette. To tie this take your cordelete cord and clip it into all three pieces. Then much like the two-point cord pull down from between the three pieces grab the bottom strand and tie either a figure of eight or an overhand.

Picture 8

When we do the NERDSS analysis on the three-point cordellette we find the same results as we had with the two-point set-up.

Combination Anchors

The next two three -point anchors we will cover are the combination anchors. To build these anchors we will take two pieces and cross sling them. We then use either the two-point cordellette **(Picture 9)** or the direct tie in **(Picture 10)** to join the crossed sling with the remaining piece to form a three-point anchor.

When we analyze the combination anchors we notice that they are more equalized than either the two point cordellette or the two-point direct tie in. Notice in **Pictures 9 and 10**, if the belayer were to lean to the right how the two pieces that are crossed slung would get weighted. On the other hand if the belayer leaned to the left, only one piece would get weighted.

The result being that if you can predict which direction a secondary pull will come from you can set up the anchor so that at least two pieces will take that force.

Picture 9

We do not cover the three point crossed sling anchors because due to the friction caused by the multiple twists this anchor system does not distribute the load very effectively. Given that the main reason to use this type of system is its ability to distribute the force there is no advantage to the three-point crossed sling.

Below is a chart comparing the 3-point anchors.

	No Extension	Redundancy	Distribution	Strength*	Simplicity
Three Point Cordellette	Yes	Yes	Limited	Good	Simplest
Two Point Cordellette/Crossed Sling Combination	Yes	Yes	Good	Good	More Complicated
Two Point Direct Tie In/Crossed Sling Combination	Yes	Yes	Good	Excellent	Most Complicated

*All three anchor systems are strong enough for multi-pitch climbing systems if the proper width or diameter cord or slings are used

Picture 10

Four or More Point Anchor Systems
To build anchors that have more than three pieces you can follow the same basic concept. First cross sling the pieces until three points remain then do a three-point cordellette system or cross-sling the pieces until two points remain and choose between either the two-point cordellette or the direct tie in.

Angles and Their Effect on the Distribution of Force
One thing that will affect all the anchors described above is the angle that is formed when the pieces are joined or when the sling or cord is wrapped around a tree or horn. All the angles formed should be acute angles. Any angle above 0° will increase force somewhat but once an angle reaches 90° the force on the anchor will be inappropriately multiplied on each piece. At 90° for instance a force of X on the anchor will create a force of approximately ¾ x on each piece, an increase of 50% on the anchor system. At 120° a force of x on the anchor puts a force of x on each piece or doubles the force the anchor has to hold. At 160° the force at each piece is three times the force placed onto the anchor multiplying by 6 the force your anchor system has to hold. **(Figure 1)**

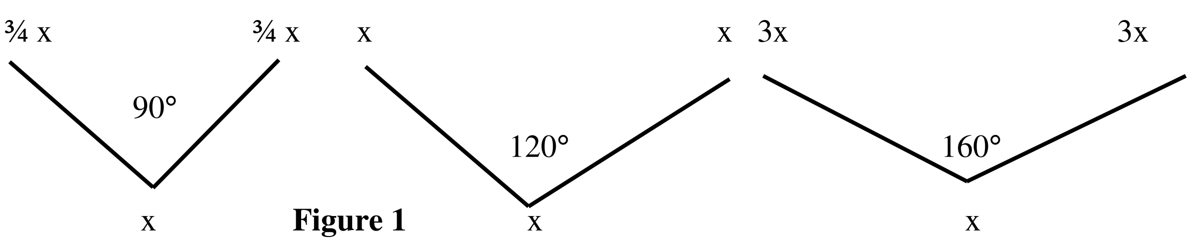


Figure 1

This can occur even if the outermost strands of a three-point cordellette creates the obtuse angle (**Picture 11**). Even though the middle strand of the cordellete may mitigate the problem somewhat the chances that you will be able to get the three pieces working together to effectively hold any force are slim.

Picture 11

Special Circumstances and Methods

To adapt these various anchor systems to the terrain and to the location of our gear placements we need to be able to do a couple of things. First we need to be able to lengthen our cordellette and crossed-sling and we need to be able to shorten our cordellette. This shortening allows us to have the master point of the anchor at the right height so the belayer can take a proper stance to belay the leader or the second. Lengthening allows us to reduce an angle that is inappropriately large.

Picture 12

Shortening Anchor Systems

We will cover three methods for shortening the cordellette. The first method is to simply double your cord and use the doubled over cord as you would normally use your cordellette. The second way is to tie an overhand knot in your cord and use the now shortened loop of the cord to build your anchor (**Picture 12**). When you tie the overhand you should make sure the junction knot is in the section of the cord that will not be used. If it is not you will have to deal with two knots when you build the anchor.

Another way to shorten the cordellette is instead of tying a Figure of Eight knot at the bottom of the cord you keep wrapping the excess before tying the cord off **(Picture 13)**.

Picture 13

It is rare that you need to shorten a crossed-sling anchor. Given the strengths and weaknesses of the crossed-sling it is primarily used on two good bolts and it is done with a shoulder sling, which is what gives it its simplicity. If you ever do need to shorten the crossed-sling you can use the second technique we discussed. **(Picture 15)**

There is one case when you might want to complicate the crossed-sling but it would not be just to shorten it although it does do that to some extent. The situation I am referring to is when you are forced to anchor onto two poor but equivalent pieces such as you might find on an older climb with two quarter inch bolts. In that case you can use a crossed-sling that has limiter knots tied into it **(Picture 14)**. The limiter knots are overhands knots that are tied into each leg of the crossed-sling. They are called limiter knots because they limit both the extension and the range that the crossed-sling will slide to distribute the load.

Picture 14

When limiter knots are tied into both legs as is depicted in **Picture 14** they also create a redundant system. Some find the analysis of the crossed-sling with limiter knots so positive they use it on a regular basis. Most climbers and guides though find that tying the crossed-sling with limiter knots so tedious that it is not very efficient. Not only do you have to tie the limiter knots, you can only use two-point anchors or combination anchors with this system. Add to that the complexity of another knot to shorten the

Picture 15

sling when need be (you will need to do this a fair amount of times) so the crossed-sling with limiter knots is generally reserved for special circumstances by most climbers and guides **(Picture 15)**.

Picture 16

Lengthening Anchor Systems

Lengthening the cordellette or the crossed-sling is another skill that is helpful. We can do this by adding a sling or quickdraw to the appropriate piece, this has the effect of adding length to one leg of the sling or cord **(Picture16 and 17)**.

Picture 17

These techniques can be used on three-point combination anchors as well. Shortening the cordellette is the same as described above. You can also lengthen in the fashion described above. If you run into a situation where one piece in your anchor is quite some distance above the two pieces that will be crossed-slung you can add a quickdraw or a longer sling if need be to the higher piece so that the cordellette can then reach.

Picture 18

If on the other hand the two pieces that will be crossed-slung are some distance above the single piece you can add the quickdraw or longer sling to the crossed-sling so the cordellette can reach **(Picture 18)**

Upward Pull Pieces and Their Necessity
Much has been written about the need for an upward pull piece in the anchor. The discussion of the need for an upward pull piece in an anchor requires a discussion of belaying techniques, specifically techniques of belaying the leader. That discussion is for the most part beyond the scope of this anchoring handout but since deciding if we are going to use an upward pull piece or not is an anchoring issue we need to get into the belaying discussion somewhat.

To belay a leader while we are on the cliff we need to;

1. Protect the belayer from getting slammed into the cliff while catching a fall once the leader has placed protection.
2. Protect the leader from the belayer losing his or her balance, falling off the stance and pulling the leader off the climb.
3. Making sure the belayer is set up to hold a fall without protection in. This fall could result in a downward pull on the belayer.

To accomplish these things we need to anchor the belayer. We have two basic techniques for anchoring our belayer.

1. *Technical* The use of the rope, slings, nuts, etc. to create an anchor. This is what most people think about when they think, "anchor" and the type of anchors we have been talking about.

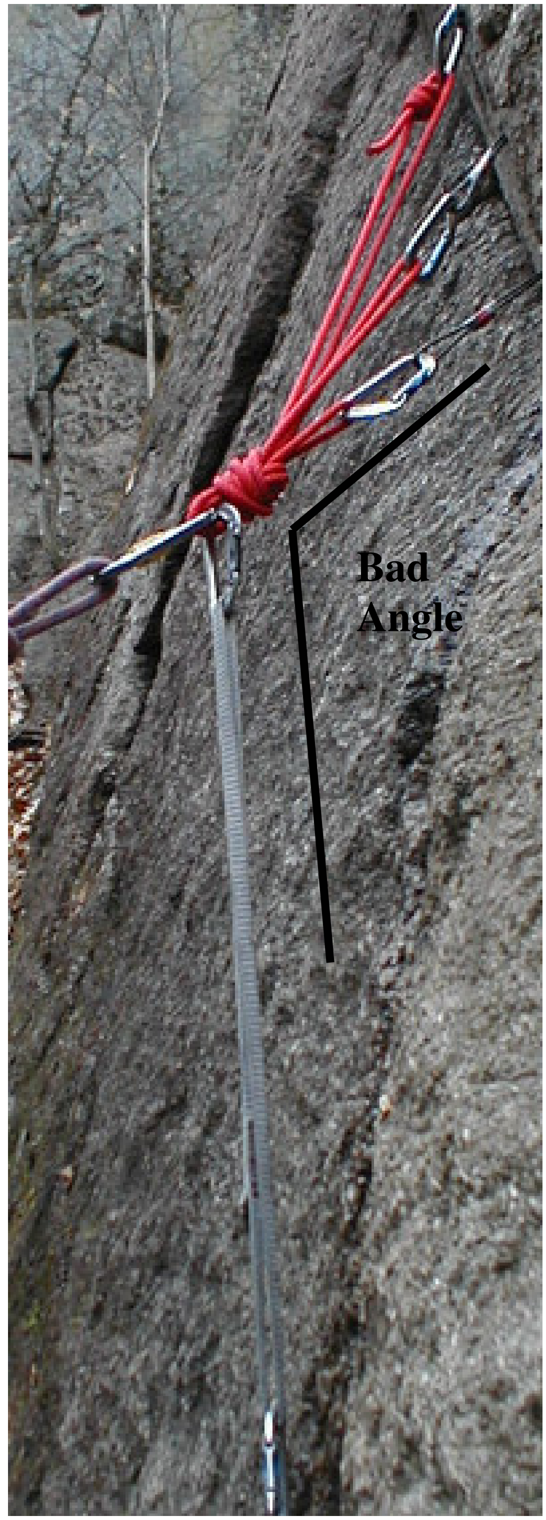
2. *Stance* This is an old fashion concept of anchoring. This form of anchoring relies on the bracing and positioning of the belayer to withstand a force.

We can use the anchoring methods we described above to protect the belayer from falling off the ledge and pulling the leader off the climb and to hold the factor 2 fall. If our anchor can do those things it needs to be above and in front of the belayer. To keep the belayer from rapidly accelerating into the cliff should a leader fall with protection in requires that the gear anchor be behind and below the belayer. In most cases on multi-pitch climbs the only thing below and behind a belayer is air!

If the anchor we build in no way can keep the belayer from slamming into the cliff but it can hold the belayer up and hold the factor 2 fall we should position the anchor in the best possible place to do those two things. That position would be as high as comfortably possible above the belayer.

The problem still remains how to keep the belayer from slamming into the cliff and this is where many suggest using an upward pull piece into the anchor. The reasoning is that once the belayer gets pulled into the cliff he or she would get pulled above the anchor and dislodge the pieces the anchor is comprised of. If we have a reasonably high anchor so that the lowest piece in the anchor is around chest level (this is the lowest that a piece can be to have an anchor effective at holding a factor 2 fall) that would mean the belayer would have to get pulled forward into the cliff and then dragged above the anchor moving double the distance they were initially away from the anchor. This would all have to take place in the amount of time that the force of the leader fall was in the system, which would be less than a second. The belayer in most leader falls will not get pulled straight up, he or she would get pulled first into the cliff then dragged up. If the force of a leader fall could generate enough force to do that in less than a second, the belayer would no doubt be seriously injured or even fatally injured by the impact into the cliff. The only way that the belayer can protect himself or herself from the impact into the cliff is to lean back against the anchor and brace themselves.

Some may ask, what is the damage in using an upward pull piece? Beside the more obvious problems of complicating the anchor with its resultant time, equipment and energy expenditure, many upward pull pieces can also multiple forces on the anchor. The angle that is formed by clipping an upward pull piece into the anchor is often obtuse enough to add a substantial amount of force into the anchor **(Picture 19)**.



Picture 19

Another option is to connect the upward pull piece directly into the belayer. This takes away the angle that is formed but in most cases does not protect the belayer from slamming into the cliff. In some circumstances it may even accelerate the belayer into the cliff and may put the belayer in a poor position to brace themselves.

There are some situations that anchoring the belayer down by connecting an upward pull piece to the belayer's harness is necessary and does work. The first situation is when you are on a steep hanging belay, the next is if you find yourself belaying below an overhang and the first piece of protection is at the lip and the third situation is when a child or very very small person is belaying a full size adult. In that situation the belayer needs to be leaning against the rock and directly below the first piece of protection so they cannot accelerate into the cliff. This type of positioning will limit the ability of the belayer to hold a factor 2 fall so the leader will need to place a piece of protection immediately upon leaving the ledge.

Conclusions

Anchors are an important piece of the technical climbing system. The techniques outlined above give you a systematic way to approach their construction. This system gives you a basic set of plans that should allow you to adapt to the terrain and placements on any given climb. By having a systematic approach you are able to quickly and efficiently adapt to the variables you will need to take into consideration when deciding where and how to build your anchor.

These techniques need practice and you need a complete understanding of their strengths and weaknesses. You also need an understanding of how the terrain will affect the forces and circumstances of the forces that the anchor will have to hold. The combination of a systematic approach along with an understanding of what, where and how the anchor works are crucial to developing a solid skill in anchor building.