

The following are the main types of natural anchors. Their tying methods are also introduced below.

Standing Trees

For thick trees with diameter at breast height of approximately 20cm or more, establish anchor points as high as possible on the trunk within strength limits. If beginning main rope use, use rope end to directly weave clove hitch into standing tree for connection, then create bowline with remaining portion. (Use clove hitch in combination considering knot tying errors).



When connecting at rope middle, wrap loop slings or daisy chains around the trunk with girth hitch and connect to rope through carabiners. (Anchor height is secured since it won't slide down even when tension is released)



When obtaining anchor from shrubs where a single trunk lacks sufficient strength, bundle multiple trunks with girth hitch.



Or distributing load by using knots shown as below across multiple branches.



When there is a middle branch and no need for a girth hitch, using it double provides higher strength. When particularly high strength is required, tie a tensionless hitch around the main trunk.



Pay attention to the angle!

When using a girth hitch, be aware that the greater the angle of the pulling section, the greater the strength loss.



Boulders and Bedrock

Large boulders that stop stably or large protrusions of bedrock can be used as anchor points.

Consider load direction and confirm shape prevents slipping out toward the open side. If beginning rope use, rope may be directly connected with bowline or similar.



When connecting to rock, wide tape slings are effective.

(Compared to rope where abrasion with edges is point contact, tape has increased contact area with edges, resulting in less fiber damage)



The following can also be applied to large tree trunks.

When connecting with open slings wrap around the anchor 2-3 times then connect with a tape knot and load only one strand.

This tightens around the anchor making it less likely to slide down even when tension is released.

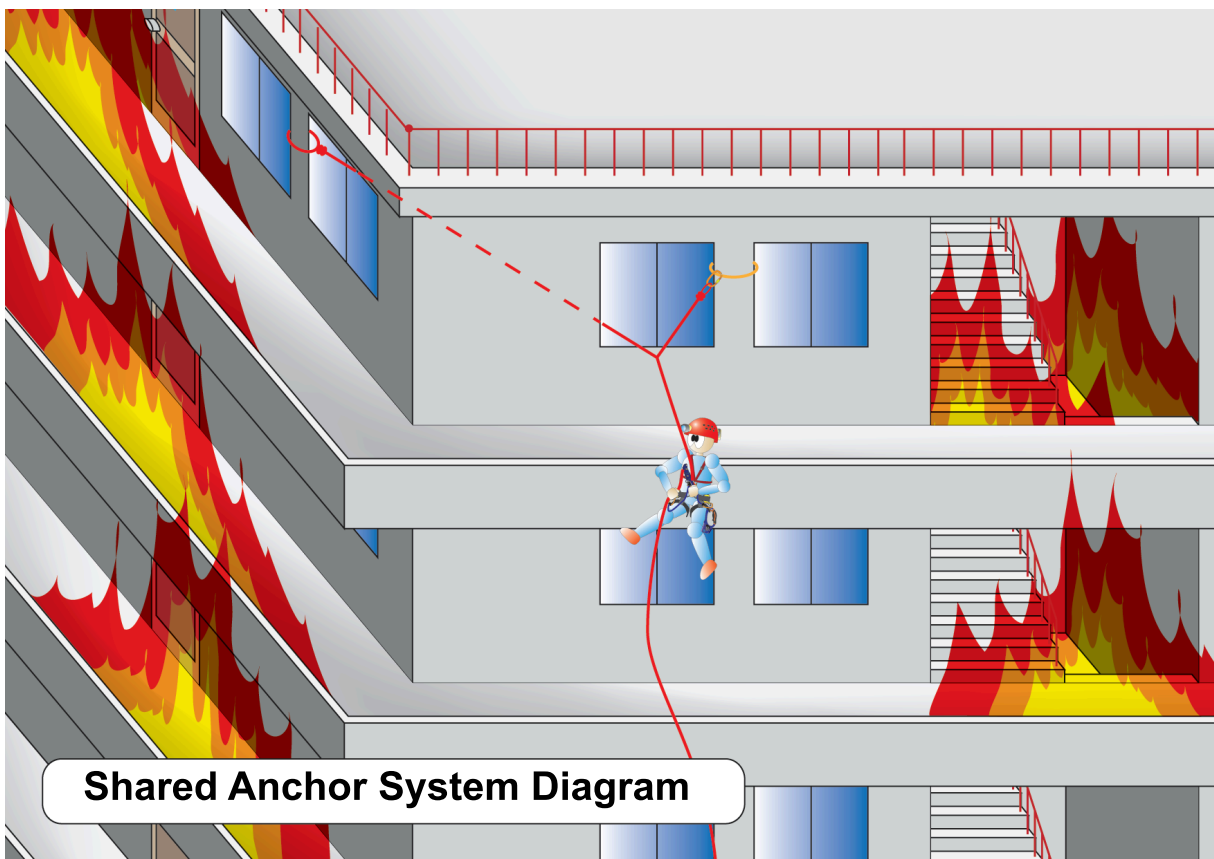
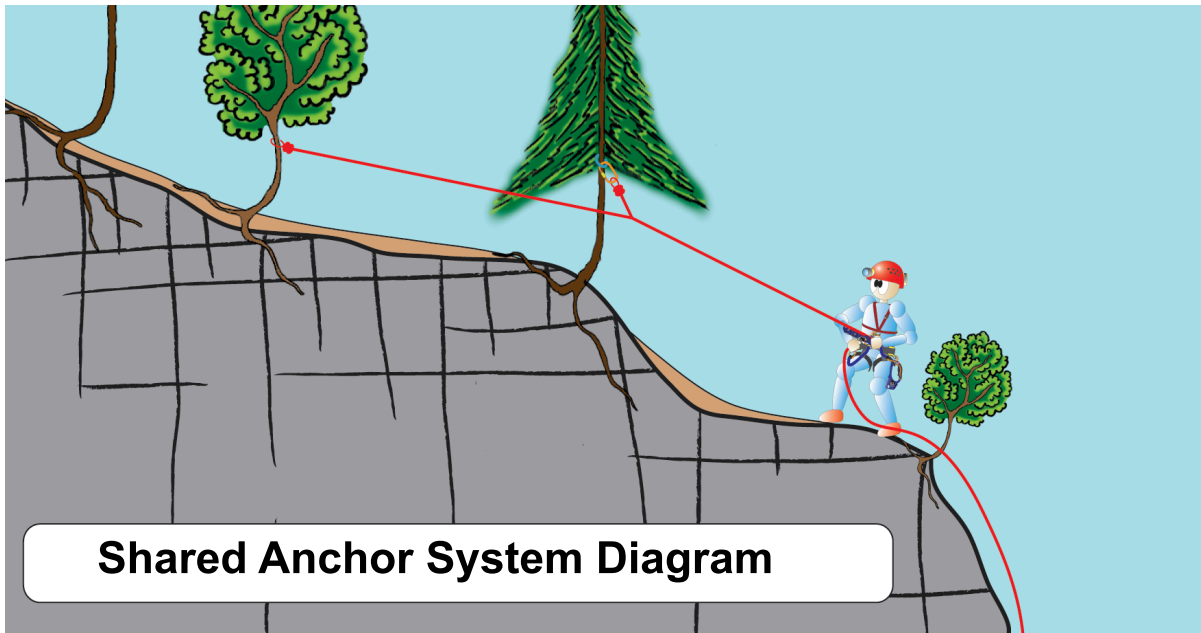


Pre-made into loop and girth hitch is also possible or if auxiliary sling strength is sufficient, single girth hitch may be created.



Shared Anchors System

A system that distributes and applies load across multiple anchors. Also called a Y-belay because of its Y-shape.



There are two types of Y-belays: the independent distribution Y-belay, which fixes the load distribution ratio, and the sliding distribution Y-belay, in which the rope or sling flows so that the load ratio remains constant at all times.

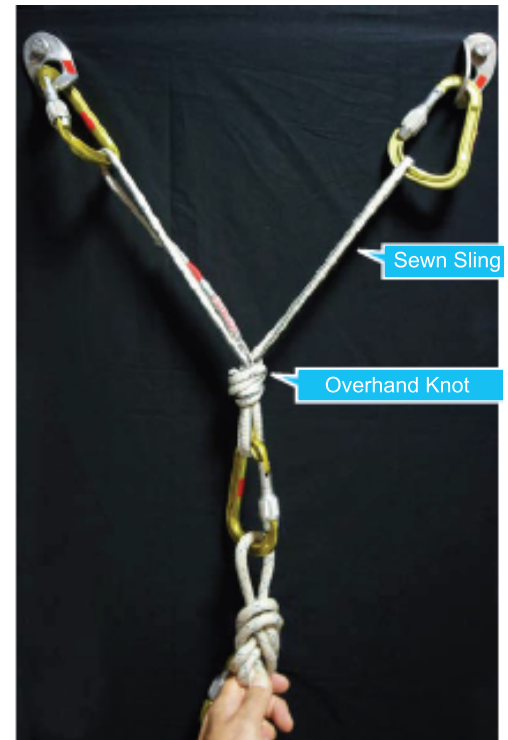
❶ Independent Distribution Y-Belay

A method that independently fixes the length of each arm of the Y-belay, also fixing the load distribution ratio.

Can be constructed with minimal consumption of rope or sling, and if one rope within the Y-belay breaks, it is backed up by the other. In general SRT, there are few cases where loads need to be completely evenly distributed, so unless there is a specific reason, use an independent distribution Y-belay.

An anchor that uses a Y-belay created by connecting a rabbit knot and sewn sling with an overhand knot.

Since only one knot is being used, if that is incorrect it would be fatal.



When anchors are adjacent, connection methods using rabbit knots or bowline on a bight are possible, but backup connections should be used to avoid single knot dependency.

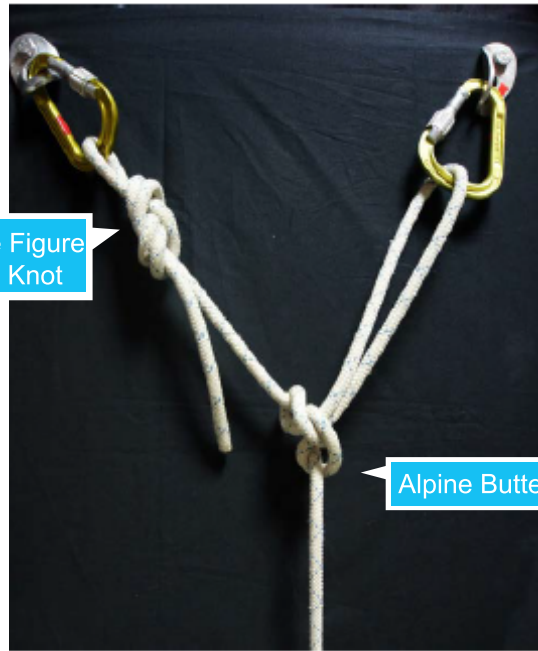


After installing the backup anchor, the method of tying the middle of the rope to the main anchor using an alpine butterfly is called the "classical Y-belay,"

This is the most frequently used method as it is the most rational tying method that minimizes the consumption of rope and auxiliary equipment.

Double Figure Eight Knot

Alpine Butterfly

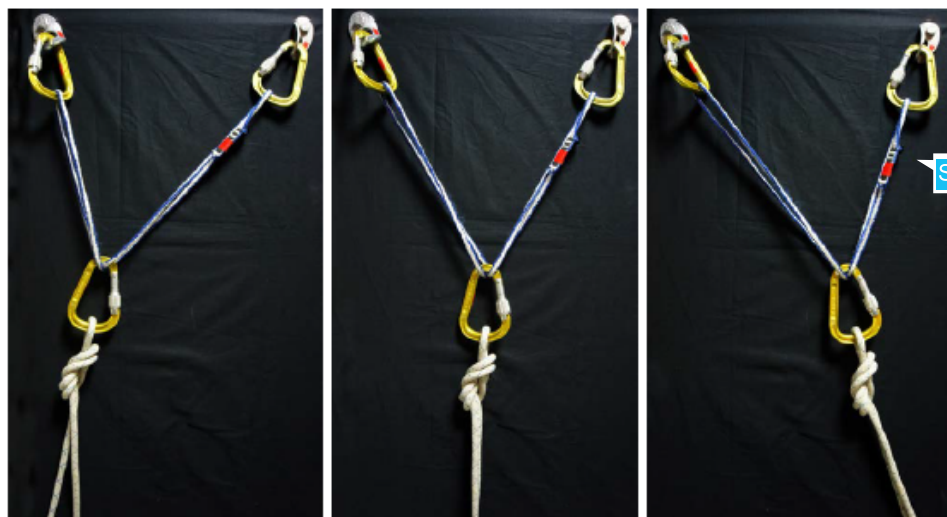


② Fluid Distribution Y-Belay

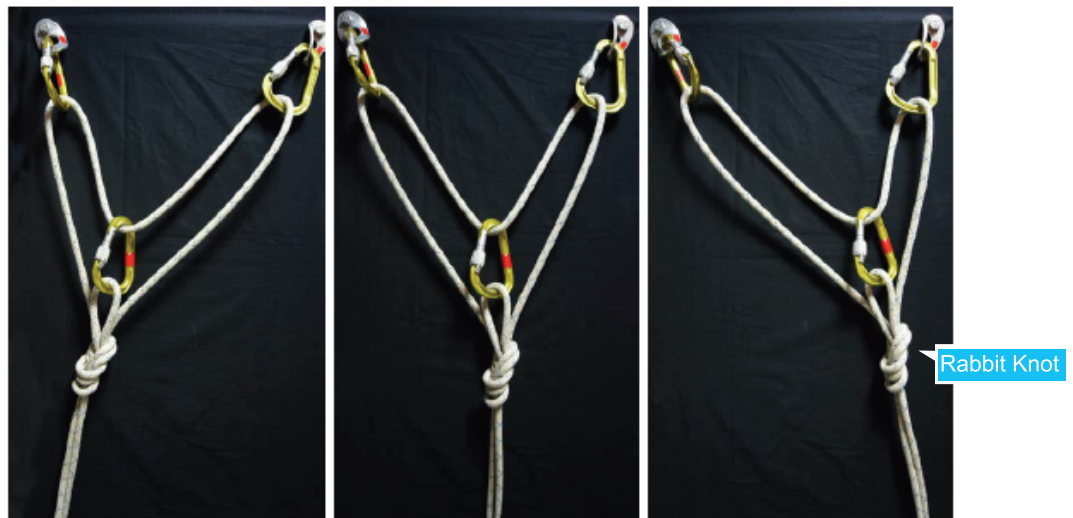
A method that constantly distributes load evenly to the anchors by connecting multiple anchors with movable rope or slings. For construction, methods include using loop-style slings or using rabbit knots or bowline-on-a-bight in unconventional ways.

When fabricating the sliding section with slings, twist the section between anchors of the loop sling once to prevent complete failure in case of anchor detachment. With fluid distribution, the load automatically equalizes even when the direction of descent changes.

Example of a fluid distribution Y-belay using a sewn sling.

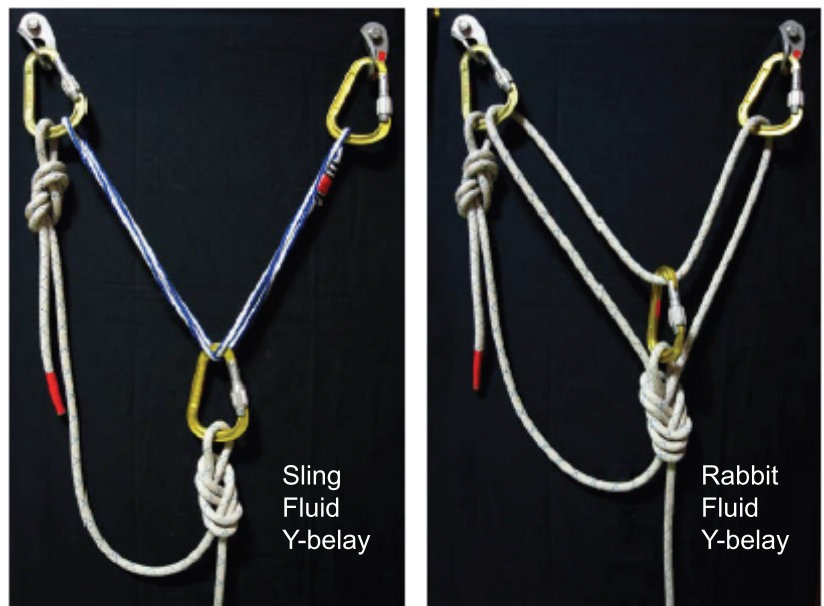


Example of a fluid distribution Y-belay using a bowline-on-a-bight.



The disadvantages of fluid distribution include the fact that if the sliding section breaks, all compound anchor points will fail, and rope or sling consumption is high.

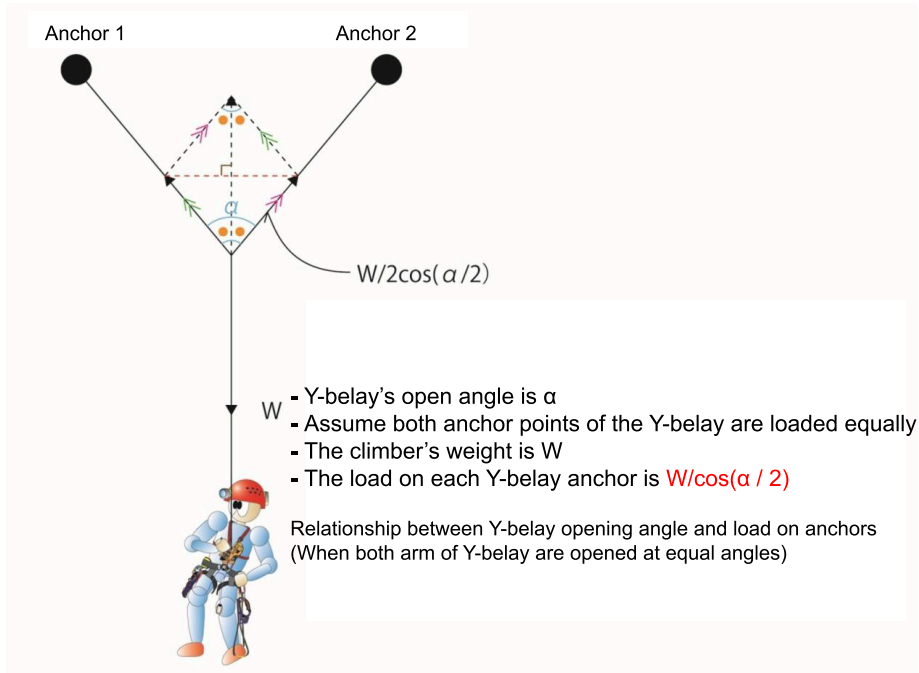
As a countermeasure, it should not be used alone, but rather should be used in conjunction with backup ties.



Y-belay (Load Distribution System)

① Opening Angle

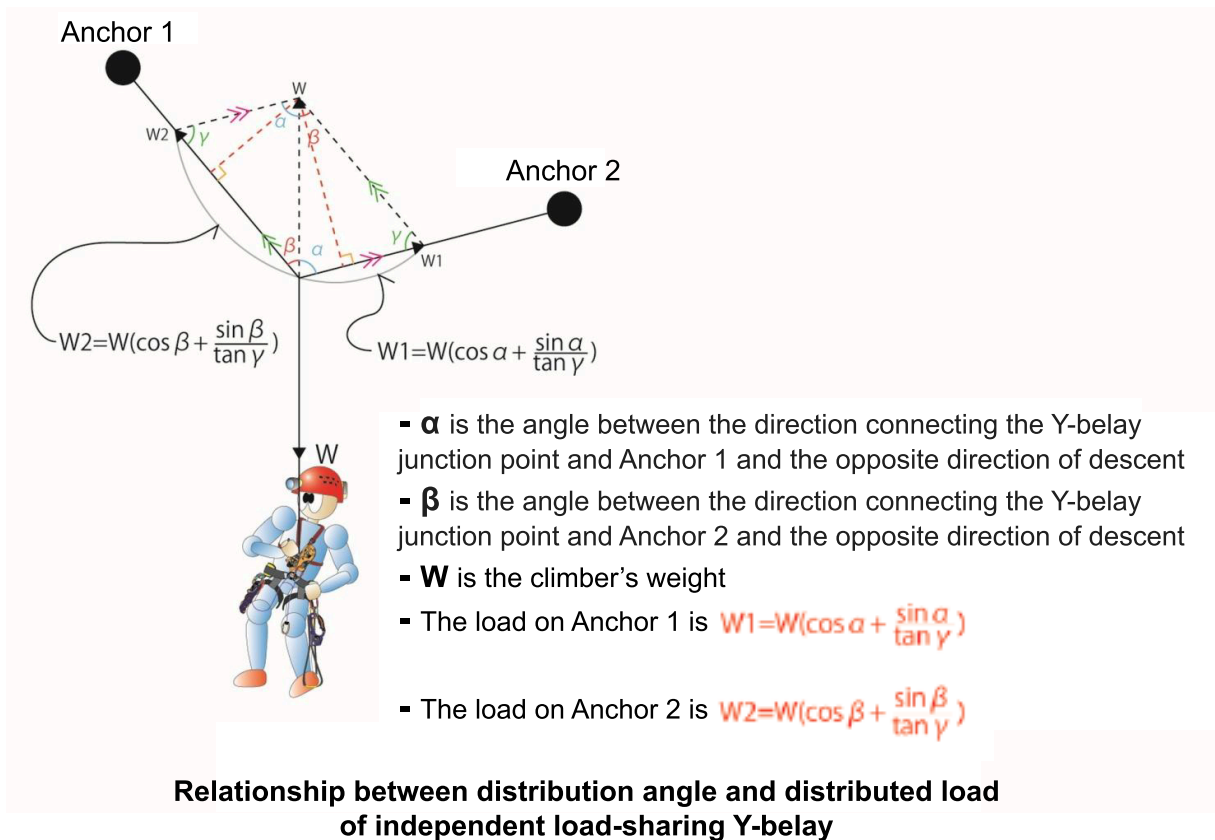
Regardless of fluid or independent type, in Y-belays, larger opening angles (α) between anchors result in greater loads on anchors. For fluid distribution and equal-angle independent distribution, when Y-belay opening angle exceeds 120° , anchor loads exceed rope user's body weight.



Angle of Y-belay α	Distributed load on each anchors (Climber's weight = 0.1)
0	0.5
10	0.501909919
20	0.507713306
30	0.51763809
40	0.532088886
50	0.551688959
60	0.577350269
70	0.610387294
80	0.652703645
90	0.707106781
100	0.777861913
110	0.871723398
120	1
130	1.183100792
140	1.4619022
150	1.931851653
160	2.879385242
170	5.736856623
180	∞

② For independent distribution Y-belays with unequal load distribution

Anchor loads may exceed the rope user's body weight when Y-belay opening angle exceeds 90°.



In independent distribution Y-belays, descent direction may change during descent, potentially altering Y-belay distribution ratios. Therefore, independent distribution opening angles should be within 90°.

To distribute loads to both anchors, predict descent range beforehand and construct Y-belay so this range falls within the angle formed by independent distribution Y-belay arm extension lines.

Two conditions when constructing independent distribution Y-belays:

- Is the Y-belay opening angle within 90°?
- Does descent activity range fall within the angle formed by Y-belay arm extension lines?