

# Up, Up, and Away! Well, almost...

## Rope Suspension Fundamentals

### Overview

Rope suspension requires an intimidating amount of technical knowledge that is often simplified in favor of helping students get into the air with a basic tie during a 90 minute class. While it's possible to achieve a suspension within that time, students are often left with an incomplete introduction to the fundamentals. Rather than leaving the ground, attendees will receive a foundational knowledge of equipment, safety factors, and practical considerations for a broad range of suspension styles. This unique class is geared toward aspiring and experienced riggers alike.

*Rope suspension is edge play, it is your responsibility to play within your abilities and understand the risks that you and your partner are taking.*

### About This Document

**This guide is not a substitute for the experience, knowledge, and supervision of an instructor.**

Learning how to perform suspensions is a major goal for many rope bondage enthusiasts; however, like driving a car, suspension is best learned under the supervision of a competent practitioner. While that's an easy statement to make, it's also true that the kink culture is built upon breaking taboos, testing limits, and learning through trial and (sometimes tragic) error. As more and more skill-based kink information finds its way into print and online, the topic of rope suspension is beginning to emerge. This document is an experiment - a way to respect the liability and safety concerns of the rope community while providing a solid foundation (and hopefully respect) for the skills required to responsibly engage in rope suspensions. There are plenty of arguments still to be made about the dangers of censorship, the responsibility of those providing instruction, and ultimately, the freedom for consenting adults to make their own decisions, so we'll see where this experiment leads!

### Bio

I'm a fun-loving rope geek and sex educator who has found a home in the Midwest kink community. When I'm not traveling to events, I contribute to the Iowa State University CUFFS group, and serve on the board of Minneapolis TNG group Min-KY. Although I'm a relatively new member of the scene, I've presented at numerous events across the country, including Kinky Kollege, Shibaricon, Denver Bound, and Beyond Leather.

As a presenter, I aim to provide a comfortable down-to-earth learning environment for all genders, orientations, and experience levels.

My long list of presentations, events, and class materials can be found at <http://www.kinkfriendly.org>

Enjoy yourselves!

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## Introduction

Rope bondage is a highly technical topic. There are classes about rope conditioning, decorative knots, bondage styles, rope handling, energy exchange... you name it and there's probably a weeks-long conversation archived in your favorite mailing list about it! While some practitioners are content with simple cuffs from a beginner-level class, many of us eagerly ask "what's next?" Additionally, given the beautiful aesthetics and technical knowledge required, it's no surprise that suspension is such an attractive topic in the rope bondage community.

### *A Matter of Focus*

Remember, this is the first step in learning about suspension. The information presented here specifically addresses technical factors and does not focus on the top's connection with their partner. Paradoxically, while suspensions can look like some of the most amazing scenes, they demand a lot of technical attention from the top which may ultimately distract you from the emotional side of your play. As you gain experience and learn more about suspension, you open the doors for the emotional/energetic interaction to emerge.

### *Disclaimer*

I am not an engineer, climber, or carpenter. This information comes from my personal experience and your mileage may vary. Remember to play within the limits of your abilities and if you have any doubt about this information, err on the side of safety.

### *A Note To Dungeon Monitors*

While performing suspensions may require plenty of instruction, practice, and know-how, effectively DM'ing suspension scenes is a very useful skill - especially as so many new rope artists become interested every day. This guide contains the tools you will need to identify aspiring riggers (hint: they're the ones checking out the architecture and carrying the bag of carabiners) and come up with a few good questions to evaluate their knowledge level, comfort, and experience.

## Overall Safety Differences

Suspension introduces a number of additional safety concerns to rope bondage. While every scene has its own unique risks, the following are applicable in a majority of cases.

Gravity - What goes up, must come down - and if it hasn't come down yet, gravity is still pulling on it! Without secure harnesses, strong ropes, and proper knots, your suspension may not remain one for very long.

Prior Planning/Escape Route - At the very least, be sure your kit contains enough rope, the proper hardware, and a cutting tool. Once you have the tools, you need a plan. Think about the ties you expect to do, the steps required to get your partner in the air, and an escape route. Knowing how to gracefully end a suspension, either at the end of the scene or in an emergency, is just as important as your plan for going up! While the plan could simply be "untie everything in reverse" that may not always suffice.

Forces - In floorwork, your partner's body is supported by the ground. Once you leave the ground, the number of suspension points, rope strength, diameter, and position take on a much greater importance. See the "Basic Physics" section below for more detailed information.

Anatomy - Your partner's body weight is working against them while they're suspended. As a result, rope position and anatomical knowledge become much more important. In general, avoid tying directly on joints and attach support lines to large body structures using non-restricting cuffs or harnesses. Specific suspension ties are beyond the scope of this document.

Stress - Everything mentioned above leads to physical and mental stress for both the top and bottom. While the top is continually juggling the technical elements of the scene, their partner has to process many new sensations.

## Basic Physics

Because your partner's weight is completely supported by the ropes rather than resting on the ground, the physics of suspension bondage are quite different than those of floor work. For instance, instead of rolling onto their side to regain comfort, your partner must continually choose which rope(s) will bear the majority of their weight - instantly adding a level of predicament to the scene. The increased tension resulting from gravity makes restricting circulation, impinging nerves, and pain more likely to occur.

A note for eels: When performing suspensions, I generally do not consider escapability as a component of my ties. If my partner would like to negotiate with gravity, I certainly won't stand in their way!

### **The Pit and the Pendulum**

An object hanging from a single line (rope) connected at a fixed overhead point will stay in place because the upward force exerted by the rope directly counteracts the downward force of gravity. (Figure 1a)

If the object is not directly under the overhead point, the line will pull the object toward that point, causing it to swing like a pendulum. (Figure 1b)

Consider a playground swing - the further back it is pulled, the faster it moves. In other words, the more horizontal distance there is between the object and its overhead point, the more force it will experience.

Applying these rules to suspension, each attachment (leg cuff, chest harness, waist harness, etc) can be treated as a hanging object. The location of the corresponding overhead point will determine how much force your partner's body feels at that location.

In Figure 2, the bottom's body is in the same position, while undergoing very different forces. In 2a, their body is being pulled outward and allowing their chest to expand while breathing and helping their core muscles maintain their body's position. Whereas the ropes in 2b pull the bottom's body in on itself, restricting their breathing while also making it more difficult to maintain their position. While both suspension types are valid and commonly used, considering the abilities of your bottom may result in a longer, more comfortable scene.

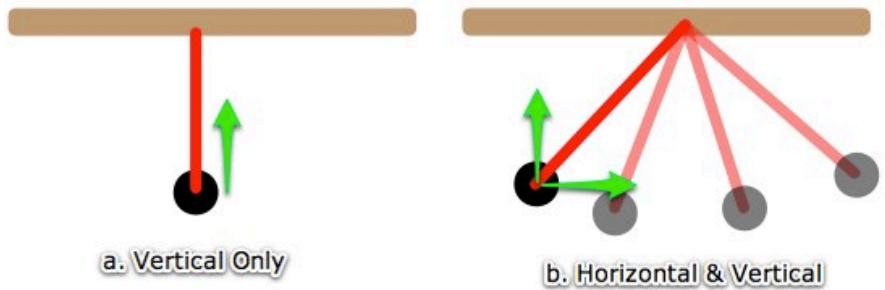
### **Weight, Kilonewtons (Kn), Safe Working Load (SWL), and Mean Breaking Strength (MBS)**

Let me say this up front: With the proper equipment and consideration, weight is not a limiting factor for suspension. That said, it is important to understand how to choose the appropriate equipment for the job. Since most stores do not carry impact toys or other such implements, kinksters often rely on "pervertable" items to fill their toybag. The good news for rope enthusiasts is that legitimate, safety-rated climbing equipment is in wide supply! The only caveat is that climbing gear is rated using kilonewtons instead of pounds so it requires a little bit of math. For our purposes (i.e. suspending people in an environment with constant gravity - Earth) one Kilonewton is about 225 pounds, or slightly heavier than an average male in the United States.

While a person's weight (mass) does not change if they're jumping, they will land on the ground with much greater (up to 5-10x more) force than if they were standing still. Applying that concept, suspension hardware must be strong enough to withstand the forces generated by a moving bottom.

The term "Safe Working Load" indicates the maximum weight that should be active/moving/live on a piece of equipment. This measurement includes a 5-10x safety factor. On the other hand, "mean breaking strength" indicates the weight or force that's known to cause the equipment to break, bend, or otherwise fail. For example: a carabiner whose safe working load is 1 Kn can support a moving person who weighs 1 Kn (225 lbs), and would likely have a MBS of 5-10kn (1125-2250 lbs).

**Note: For more information on these physics topics, I recommend "The Stage Rigger's Handbook" by Jay Glerum.**



**Figure 1 - Force Components**



**Figure 2 - Suspension Forces**

## Rope Selection

Generally speaking, any rope, string, or cord can be used for bondage and with enough dental floss, suspension is probably even possible - though not recommended for beginners! When selecting rope for suspension, the same general rules apply: synthetic rope may not hold knots as well, thick rope will provide more comfort but bulkier knots, etc. Since suspension introduces some additional variables, keep the following in mind as well:

- Stretchy rope may cause a once-secure harness to slip and become uncomfortable/unsafe.
- Rated climbing rope may provide piece of mind; however may not be friendly to skin (too rough, inflexible, etc).
- Natural fiber ropes (hemp & jute) are natural products and thus have widely varying quality.
- Most support lines employ 4-8 strands of rope, effectively multiplying the strength of the overall system. This, along with utilizing multiple support points (chest harness, waist harness, and wrist/ankle cuffs) means that any single strand of rope will only be holding a small portion of your partner's weight.
- Some ropes are more durable than others - for example hemp is a denser and stronger fiber than jute.
- Once a rope begins showing signs of fatigue - chunks of stray, broken fibers - it is time to retire that piece from suspension.
- Choose support lines that are long enough to lower your partner to the ground in an emergency.

Note: Most people use 30 foot, 6mm (1/4") or 8mm (5/16") hemp or MFP for suspension. While some prefer the larger diameter for its strength, I typically choose the diameter based on the comfort of my partner since 6mm is of adequate strength for most situations.

## Tools and Hardware

### General Warning

Safety-rated climbing gear is available and recommended for suspension. That said, many people use steel hardware with tremendously high "ratings" which are accompanied by labels that say "not for use with playground equipment" - use these at your own risk and always assume the included rating is the equipment's MBS.

### Carabiners and Rings

The purpose of a carabiner or "Shibari" ring is to provide a smooth, non-damaging surface for your ropes as you hoist, pull, or otherwise adjust your ties. Functionally, rings provide more surface area than most carabiners, but the effect is the same. I generally attach the main support line of my suspension to a ring, then add carabiners to the ring as I add new support lines to the suspension.

There are various shapes, sizes, and strengths of carabiners. The most important consideration when choosing a one is to ensure that it is rated for climbing. The ubiquitous "keychain carabiner" trend has made this somewhat more dangerous, but rated carabiners will be clearly marked similar to the illustration. Other carabiner properties are the gate type: solid - a solid (sometimes curved) piece of metal serves as the clip, wire - a loop of wire creates the spring-loaded gate, and locking - the gate contains a mechanism for securely fastening the clip so that it cannot accidentally open (screw-lock and twist-lock are the common types). For the majority of suspensions, any climbing-rated carabiner is sufficient; however, some people prefer specific carabiners based on their type, color, material, or gate type. I prefer wire gate carabiners because they are lightweight, inexpensive (\$6.00 for 24Kn), and easy to clip onto my ring or other carabiners as needed. While twist-lock carabiners provide the most security, most suspensions are done under very controlled circumstances where all of the carabiners are within immediate view with very little danger of coming open.

### Swivels

Rated swivels are an accessory often employed in single-point suspensions. Most obviously, they allow the suspended person to spin, but for those that don't like as much motion, they remove the need to "unspin" as well. You can find swivels online and at well-equipped climbing equipment resellers. They are often used for high-angle rescue and arial dance.



Figure 3 - Carabiners  
Rated Wire Gate (Top)  
Keychain (Bottom)

## Quick Releases

I have heard urban legends of venues requiring the use of panic snaps for suspensions. While there are potential safety benefits for quick-release hardware, the general clips used in the kink community are panic snaps for equestrian use and are not rated for loads. There are load-rated quick releases for marine use, however you'll have to look online or at specialty stores to locate them.

## Lifting Devices

Depending on the style of suspension, a number of lifting devices may be employed. These may be manually operated or electric and utilize chain, steel cable, or rope. *Using a lifting device introduces additional safety concerns, see the suspension types section for more information.*

### Hoists and Winches

Hoists and winches are often permanently installed pieces of equipment designed to lift heavy loads in construction or manufacturing environments. They are available from many hardware providers and their strength is rated in hundreds of pounds, or more often, tons. Manually operated chain hoists are known for their slow and loud operation, so you may not find them in many dungeons.

### Block and Tackle

Known more simply as pulleys, block and tackle setups are often connected to a suspension frame or fixed point and use rope as the primary lifting device. They generally accept a specific range of rope diameters and are rated separately from the rope used. As you add pulleys to a block and tackle it becomes easier to lift a weight; however, this comes at the expense of more rope (see table for examples). Generally, pulleys operate smoothly and quietly, but must be supplied by the rigger.

Pulleys	Rope Required (8' Frame)	Weight Percentage	Rope Pulled per 3' Lift
2	16'	50%	6'
3	24'	33%	9'
5	40'	20%	15'

## Hardpoints

Selecting a secure hardpoint for your suspension is one of the most important safety decisions you will make while performing suspensions. While it would take a structural engineer to truly determine the strength of a hardpoint, I take the following approach:

1. Trust Your Gut - Even if the dungeon owner swears that their equipment is safe and secure, the choice is ultimately yours. If there is any question in your mind about the safety of the provided equipment, find an alternative hardpoint or do a ground-based partial suspension instead. There's no need to risk you or your partner's safety on somebody else's word.
2. Avoid Eye Screws - Eye screws can be found in the ceilings and walls of many play spaces. While they are wonderful for clipping a bottom's hands over their head for a flogging, they can be very dangerous if used for suspension. Eye screws are easily identified by the gap near their base. Remember: the only thing between your partner and the ground is screw threads, friction, and mangled wood. If the wood gives way or your partner begins to spin without the benefit of a swivel, your scene may come to a crashing and disastrous end. Note: Some playspaces use forged eye bolts. These bolts, in conjunction with large washers and lock nuts can be made very secure.
3. Use Specialized Equipment - If not for the 2 safety items above, this would be number one. If at all possible, use equipment that has been specifically designed for suspension. Consult the playspace's dungeon monitors or local rope group to find appropriate equipment.



Figure 4  
Eye Bolt (Top)  
Eye Screw (Bottom)

4. Use Structural Elements - Failing #3 above, my general rule of thumb is to tie to a building's structural element that is made to support human weight. This most often includes beams which support floor joists or ceiling rafters. Note: I've been to many dungeons that are located in flat-roofed commercial buildings. If you intend to use an "open web steel truss" as a suspension point, never attach to the bottom of the structure (Figure 5).
5. "Drop a Ring" - If you can't reach the point that you'd like to tie to without a step stool, securely attach a ring or carabiner to the equipment first. This way you won't be caught off-balance while tying and won't waste a ton of rope in your support lines.

Note: This is a highly discussed topic and I've only just scratched the surface here. Jim Duvall (Seattle, WA) has given a number of classes describing hardpoint selection in great detail. If possible, I highly recommend attending this class if you have the opportunity to see it in your area.

## Conclusion: Suspension Field Guide

As an educator, I've given a number of "zero to 90-minutes" suspension classes. Each time I've stuck to a very safe, repeatable tie and completed the class with mixed feelings - worrying mostly that I committed a disservice to the attendees. Sure, they had performed a suspension, but in the end it was a watered-down walkthrough lacking the context that I hope to have provided here. The following page summarizes that context, providing risk levels for a number of suspension variables. This is a working draft with arbitrary estimations solely informed by my experiences - input is welcome.

Play wisely and thank you for reading!

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Figure 5  
Commercial Roof Joists

	<b>Low Risk (1)</b> Low Stress, High Comfort, Long Duration, Has Assistance	<b>(2)</b>	<b>Medium Risk (3)</b> Average Suspension, Practiced Rigger, Still Developing	<b>(4)</b>	<b>High Risk (5)</b> High Stress / Painful, Low Comfort, Short Duration, RACK
<b>Full/Partial</b>	<ul style="list-style-type: none"> <li>Laying On Ground</li> <li>Limb/Limbs Suspended</li> </ul>	<ul style="list-style-type: none"> <li>Kneeling, Squatting</li> <li>Knees and/or Elbows</li> </ul>	<ul style="list-style-type: none"> <li>Standing On One Foot</li> <li>“Crane Stance”</li> </ul>	<ul style="list-style-type: none"> <li>Nose/Minor Body Part Touching Floor</li> <li>“Partial” Suspension ;)</li> </ul>	<ul style="list-style-type: none"> <li>No Floor Contact</li> </ul>
<b>Height</b>	<ul style="list-style-type: none"> <li>Bottom On Ground</li> <li>Partial Suspension</li> </ul>	<ul style="list-style-type: none"> <li>Inches From Ground</li> <li>Easy to Lift</li> </ul>	<ul style="list-style-type: none"> <li>Many Feet from Ground</li> <li>Within Reach of Top</li> </ul>	<ul style="list-style-type: none"> <li>Top Required to Use Tip Toes, Awkward Footing</li> <li>Difficult to Lift</li> </ul>	<ul style="list-style-type: none"> <li>Bottom Completely Out of Reach w/out Hoist, Ladder, etc</li> </ul>
<b>Physical Demands</b>	<ul style="list-style-type: none"> <li>Hammock-Style</li> <li>Body Well Supported</li> </ul>	<ul style="list-style-type: none"> <li>4-6 Attachment Points</li> <li>Balance Req'd for Liffoff</li> </ul>	<ul style="list-style-type: none"> <li>Waist Harness Only</li> <li>Upper Body Str Useful</li> </ul>	<ul style="list-style-type: none"> <li>Minimal Attachments</li> <li>Chest Harness Only</li> <li>Core Str/Flexibility Req'd</li> </ul>	<ul style="list-style-type: none"> <li>Single Point - Ankle, Thigh, etc</li> <li>Core Str/Flexibility Req'd</li> </ul>
<b>Overhead Points</b>	<ul style="list-style-type: none"> <li>Dedicated Equipment</li> <li>Multiple Points</li> </ul>	<ul style="list-style-type: none"> <li>Structural Component</li> <li>Multiple Points</li> </ul>	<ul style="list-style-type: none"> <li>Structural Component</li> <li>Single Overhead Point</li> </ul>	<ul style="list-style-type: none"> <li>Dedicated Equipment</li> <li>Single Overhead Point</li> </ul>	<ul style="list-style-type: none"> <li>Ad-Hoc Single Point</li> <li>Tree Branch, etc</li> </ul>
<b>“Liffoff” Method</b>	<ul style="list-style-type: none"> <li>N/A - Partial Suspension</li> </ul>	<ul style="list-style-type: none"> <li>Sit &amp; Swing</li> <li>Based on Swiss Seat</li> </ul>	<ul style="list-style-type: none"> <li>Hoist: Slowly Lifted From Laying/Seated Position</li> <li>Easy to Reverse/Adjust</li> </ul>	<ul style="list-style-type: none"> <li>Rotation: First Secure Harness then Lift Individual Limbs</li> </ul>	<ul style="list-style-type: none"> <li>“Leap of Faith” - Pre-tied, Sudden</li> <li>Lifted by Spotters</li> </ul>
<b>Time on Feet/Fatigue</b>	<ul style="list-style-type: none"> <li>Ties Prepared Well Before Scene Begins</li> <li>Bathroom Break Allowed</li> </ul>	<ul style="list-style-type: none"> <li>Ties Prepared While Seated/Kneeling</li> </ul>	<ul style="list-style-type: none"> <li>Harness Tied Quickly While Standing</li> <li>Mostly Tied In Air</li> </ul>	<ul style="list-style-type: none"> <li>Extensive Preparation</li> <li>Uncomfortable Positions</li> </ul>	<ul style="list-style-type: none"> <li>Start with Partial Suspension</li> <li>Predicament/Ordeal</li> </ul>
<b>Escape Route</b>	<ul style="list-style-type: none"> <li>Already on Ground</li> <li>Minimal Untying</li> </ul>	<ul style="list-style-type: none"> <li>Stand Up</li> <li>Lower with Hoist/Winch</li> </ul>	<ul style="list-style-type: none"> <li>Pick Partner Up &amp; Unclip (Single Point)</li> </ul>	<ul style="list-style-type: none"> <li>Insert Chair/Table for Support</li> </ul>	<ul style="list-style-type: none"> <li>Multiple Spotters</li> <li>Lifting or Cutting Req'd</li> </ul>
<b>Speed / Efficiency</b>	<ul style="list-style-type: none"> <li>Fast/Efficient</li> <li>Practiced Motions</li> </ul>	<ul style="list-style-type: none"> <li>Methodical</li> <li>Check/Recheck</li> </ul>	<ul style="list-style-type: none"> <li>Gaining Confidence</li> <li>Some Fumbling</li> </ul>	<ul style="list-style-type: none"> <li>Inexperienced</li> <li>Freq. Pauses/Re-Tying</li> </ul>	<ul style="list-style-type: none"> <li>Inexperienced</li> <li>Consulting Books</li> </ul>
<b>Cooperation</b>	<ul style="list-style-type: none"> <li>Bottom Able to Talk/ Stand/Sit/Use Arms</li> <li>Bottom Helping Tie</li> <li>Lab/Learning Dynamic</li> </ul>	<ul style="list-style-type: none"> <li>Experienced Bottom</li> <li>Good Communication</li> <li>Able to Articulate Issues</li> </ul>	<ul style="list-style-type: none"> <li>Bottom Bound With Chest Harness/Arm Binder</li> <li>Limited Mobility</li> </ul>	<ul style="list-style-type: none"> <li>Bottom Mostly Immobilized</li> <li>Unable to Redistribute Weight</li> </ul>	<ul style="list-style-type: none"> <li>Bottom Immobilized, Nonverbal, Unable to Assist</li> </ul>
<b>Urgency</b>	<ul style="list-style-type: none"> <li>No Rush</li> <li>Hammock-Style</li> </ul>	<ul style="list-style-type: none"> <li>Lab/Practice Time</li> <li>Planned Progression</li> </ul>	<ul style="list-style-type: none"> <li>“2 Minute Warning”</li> <li>Experimental Positions</li> </ul>	<ul style="list-style-type: none"> <li>Intense Position</li> <li>Guerilla Photo Shoot</li> </ul>	<ul style="list-style-type: none"> <li>“I Need To Sit Down”</li> <li>Emergency Situation</li> </ul>
<b>Dynamic</b>	<ul style="list-style-type: none"> <li>Bottom Free To Move and Adjust as Needed</li> </ul>	<ul style="list-style-type: none"> <li>Rope Dancing</li> <li>Most Limbs Free</li> </ul>	<ul style="list-style-type: none"> <li>Progression Through Multiple Positions</li> </ul>	<ul style="list-style-type: none"> <li>Limited Motion</li> <li>Some Ability to Struggle</li> </ul>	<ul style="list-style-type: none"> <li>Bottom Immobilized</li> <li>Unable to Adjust</li> </ul>
<b>Assistance</b>	<ul style="list-style-type: none"> <li>One on One Instruction</li> </ul>	<ul style="list-style-type: none"> <li>Experienced Spotter</li> <li>Co-Top</li> </ul>	<ul style="list-style-type: none"> <li>Play Party</li> <li>Friends Nearby</li> </ul>	<ul style="list-style-type: none"> <li>Alone With Partner</li> </ul>	<ul style="list-style-type: none"> <li>Self-Suspension</li> <li>No Spotter</li> </ul>