

JOB HAZARD ANALYSIS	JOB TITLE: Griphoist and Highline Use and Maintenance.	DATE:	<input checked="" type="checkbox"/> NEW <input type="checkbox"/> REVISED
TITLE OF WORKER(S): Maintenance Worker Leader, Maintenance Workers, Laborers.	NAME OF ORGANIZATION: Rocky Mountain National Park	LOCATION:	ANALYSIS BY:
DEPARTMENT: Maintenance--Trails	SUPERVISOR:	APPROVED BY:	REVIEWED BY:

REQUIRED AND/OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT:	Hard hat, eye protection, ear protection, long sleeves, gloves, boots,
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SEQUENCE OF BASIC JOB STEPS	POTENTIAL HAZARDS	RECOMMENDED ACTION OR PROCEDURE
Preparing to use griphoist/highlines—packing tools to site, system set-up, etc.	Injuries or property damage resulting from misuse or lack of equipment, training, and communication.	<p>-Our most important achievement is for every employee to conclude each day without personal injury or damage to property.</p> <p>-Employees will be provided adequate orientation, equipment and training as per their duties and responsibilities.</p> <p>-Employees participate in and support an environment where all valid safety concerns can be raised and addressed, without fear of judgement or reprisal.</p> <p>-Crew leaders will conduct, whenever appropriate, tailgate safety talks to provide orientation, discuss project, safety concerns, assign work, etc.</p>
	Injuries or property damage resulting from poor communication.	<p>-Crewmembers should be aware of their surroundings, the location of other crewmembers and other trail users while using griphoists and/or highlines.</p> <p>-Good communication between crewmembers should reinforce individual awareness of real and potential hazards.</p> <p>-Communication methods and/or jargon should be discussed and agreed upon prior to moving materials.</p> <p>-Instructions should come from one person when working in teams of two or more.</p>
		<p>-If at any point, a job is deemed unsafe, workers should feel entitled to stop until the appropriate PPE or equipment is available, or the right conditions exist to get the job done safe.</p>
	Injuries resulting from lack of PPE or training.	<p>-Crew leaders and supervisors are responsible for providing crewmembers with adequate PPE and related training. Refer to block 11.</p>
		<p>-Each crew will be provided at least one first-aid kit and water-filter.</p> <p>-Crewmembers should be familiar with its location and contents at all times.</p> <p>-Basic first aid/CPR training will be available for all crewmembers.</p> <p>-Each crewmember should receive training on radio procedures, emergency response plans, and basic SAR operations.</p>
	Injuries or property damage resulting from poor planning, route selection, or lack of project management.	<p>-All employees should take an active role in hazard identification, analysis, and mitigation</p> <p>-Consider and mitigate environmental impacts from griphoist operations.</p> <p>-Good project management should include considering and implementing any of the following: scheduling, logistics, season, trail closures, signage, reroutes, temporary trails/detours, flaggers, guards, lookouts, communications, relays, visibility, signals/hand signs, fatigue, location, elevation, visitor traffic patterns/volume, and other factors.</p>

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Setting up system, trouble shooting, testing.	Injuries or property damage resulting from poor planning, route selection, or lack of project management.	<ul style="list-style-type: none"> -Explore options, fill holes, and build temporary structures to maximize safety and efficiency in moving materials, especially on steep or loose slopes. -Clear the route of hazards and debris before moving materials. -Consider using chocks, skids or logs to ease moving materials.
	Injuries or property damage resulting from misused or overloaded equipment: highlines.	<ul style="list-style-type: none"> -Questions to ask when setting up and using a highline system: <ul style="list-style-type: none"> -Where is the most useful location for the system? -Are there any conflicts/safety issues with trails or the public. -Where is the direction of pull? -What type of anchors are there? -Are they sound? Are there more than one? -Are the anchors/spar trees in the same plane? -What's the angle between anchors? Between anchors and spar trees? -Are the anchors equalized and/or independent? -What will happen if an anchor fails? -Are spar trees of questionable size? Can they be anchored? -Will anchor straps damage trees? Adjust under slack and/or pad. -Will the loads clear high spots/natural obstacles? -Do loads need to be belayed? -How heavy are the loads? -How much tension is required to lift loads? -What is the heaviest load this system can safely handle? -What is the weakest link in the system? -Where is the greatest strain placed on the system? -What is the worst case senario? How can it be prevented/mitigated? -Is there anyway to retain safety and function, yet reduce the system to fewer components?
	Injuries or property damage resulting from misused or overloaded equipment.	<ul style="list-style-type: none"> -Employees using griphoist and highline systems must be familiar with the safe working load limits and safety features of all components in the system. -It is recommended that a load calculation be done before every new or major lift, to ensure loads are within safe working limits.
Using/operating system.	Injuries from equipment.	<ul style="list-style-type: none"> -Griphoists should be oiled frequently—use 90 to 120 wt motor oil. -All tools should be inspected regularly to ensure their safe condition. -Any unsafe, defective, or poorly maintained tools should be fixed, red-flagged, tagged, rotated out of service, or discarded. -Workers should never: <ul style="list-style-type: none"> -step, sit, straddle or stand on the cable. -enter or occupy the 'dead man zone'. -needlessly touch a cable under tension -When moving materials or applying tension, workers need to remain aware of direct and potential hazards, and position themselves in such a way to minimize their exposure. -All personnel in close proximity to highline operations need to be in PPE.
Using straps or chains—anchors.	Injuries from misusing or overloading equipment.	<ul style="list-style-type: none"> -Employees need to understand the different safe working load (SWL) limits of straps and chains when oriented vertically (SWL =1X), as a basket (SWL = 2X), or girth-hitched (SWL = approx ¾ X).

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Using chain baskets.	Injuries from equipment: chains and chain baskets.	<ul style="list-style-type: none"> -Employees working with chains and chain baskets need to be familiar with their safe working load limits and basic chaining techniques. -Inspect chains and baskets prior to use and/or periodically during use. -Slip hooks should be equipped with operational gates. -Slip hooks should be taped if necessary.
Using straps.	Injuries from equipment: anchor straps.	<ul style="list-style-type: none"> -Employees working with anchor straps need to be familiar with their safe working load limits and basic wrapping techniques. -Inspect anchor straps prior to use and/or periodically during use. -Note that there are anchor-only and drag-only straps in the cache. -If anchor straps will damage trees, adjust under slack and pad. -Slip hooks should be equipped with operational gates. -Place anchor straps as low on tree as possible.
Using shackles.	Injuries from equipment: shackles and misc.	<ul style="list-style-type: none"> -Employees working with shackles and other system components need to be familiar with their safe working load limits and basic techniques. -Inspect shackles prior to use and/or periodically during use. -When in doubt, tape or cable-tie shackle pin to ensure it will not back out. -When belaying loads from a shackle, make sure the vibration or friction from the rope will not back the pin out. -Slip hooks should be equipped with operational gates.
Using tripods.	Injuries from equipment: modular spar towers.	<ul style="list-style-type: none"> -Employees working with towers and their components need to be familiar with their safe working load limits and basic set up and operation. -Inspect towers and components prior to use and/or periodically during use. -Note that each tower is unique and each piece is labeled to indicate which parts go together. -Direction of pull should strike through the center of each tower. -Ensure each leg is securely planted. Be extra careful on exceptionally hard (slick rock) or soft ground, as legs can slip or become buried under tension. -Make sure weight is evenly distributed between each leg. -When in doubt, anchor tower and/or secure legs, perform test lift and/or slowly increase weight, check towers and system often.
Using snatch blocks.	Injuries or property damage resulting from misused or overloaded equipment: multi-part-pulls.	<ul style="list-style-type: none"> -Employees working with blocks need to be familiar with their safe working loads, angle limits, and basic techniques. -Note that there are two sizes of blocks; <ul style="list-style-type: none"> -small (silver) blocks for angles between 0 and 90 degrees, -large (orange) blocks for angles between 0 and 180 degrees. -Inspect blocks prior to use and/or periodically during use. -When in doubt, tape or cable-tie block locking mechanism to ensure it will not back out or loosen. -Blocks should be equipped with operational gates. -When using multi-part pulls, make sure the additional mechanical advantage does not exceed the safe working load limits of anchors, shackles, or other system components.
Operating system	Foot injuries.	<ul style="list-style-type: none"> -Workers need to maintain constant awareness of their feet in relation to objects being moved and avoid placing them under materials.
	Hand injuries.	<ul style="list-style-type: none"> -Workers need to maintain constant awareness of their hands in relation to objects being moved and avoid placing them under materials.

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Operating system.	Injuries from materials—cuts, scrapes, pinches, etc.	<ul style="list-style-type: none"> -Clear work area often to reduce the chance of tripping or falling. -Be prepared for sudden or unexpected shifting or settling of loads when tension is introduced, especially when using chains and chain baskets. -Freshly cut stone is extremely sharp, and workers need to exercise caution while handling or moving this material.
	Injuries from overhead hazards	<ul style="list-style-type: none"> -Hardhats are mandatory for all griphoist use -Check for and anticipate any overhead hazards. Special attention to tree limbs and tops. Look up!! Shock loads especially can snap branches. -The belayer must have clear visual or verbal communication with the load attendant to avoid shockloading the system on a high center hangup. -A muenster hitch with a dynamic rope on a shackle is the standard belay. -In rigging tests only 1 of 10 belayers could hold a 200kg. drop from 2 vertical feet and none from 3 feet.
Using rigging—Working Load Limits.	Injuries or failures from overloading system or components.	<p style="text-align: center;">Griphoist Cheat Sheet—Working Load Limits:</p> <p>TU-17 = 2,000lbs (19lbs)-pins shear at 3,000lbs 5/16” wire rope (4x26) = 10,000lbs (.185lbs/ft) 3” dia. (silver) snatch block = 4,000lbs (4lbs) 4 ¾” dia. (orange) snatch block = 3,000lbs (8lbs) TU-28 = 4,000lbs (40lbs)-pins shear at 6,000lbs Griphoist handle weighs 3lbs 7/16” wire rope (4x26) = 20,000lbs (.35lbs/ft) 4 ½” (silver) snatch block = 8,000lbs (12lbs) 6 7/8” (orange) snatch block = 5,000lbs (15lbs) Tripods—recommended max load = 600lbs ½” screw-pin shackle = 4,000lbs (>2lbs) 5/8” screw-pin shackle = 6,500lbs (>2lbs) ¾” screw-pin shackle = 9,500lbs (2lbs) 7/8” screw-pin shackle = 13,000lbs (3lbs) Chain saddle grab link = 7,300lbs “Little Mule” wire grip = 5,000lbs (3lbs) “Sauerman” cable clamp (3/8”) = 4,000lbs (5lbs) “Sauerman” cable clamp (1/2”) = 7,000lbs (5lbs) Chain baskets = 9,000lbs (~43lbs) Grade 80 chain = 7,100lbs (1.5lbs/ft) Webbing slings: (10’ = 3lbs) <u>2” wide</u> <u>3” wide</u> Vertical = 6,400lbs Vertical = 8,600lbs Choker = 5,000lbs Choker = 6,500lbs Basket = 12,800lbs Basket = 17,200lbs</p>

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	Injuries or failures due to a lack of knowledge or inaccurate load calculations.	<p><u>Trails Rigging Standard Operating Procedures:</u></p> <ul style="list-style-type: none"> ▪ Size Up <ul style="list-style-type: none"> ▪ What is the Objective? ▪ What are the Hazards? ▪ Estimate Weights <ul style="list-style-type: none"> ▪ Weight x Volume ▪ System Design <ul style="list-style-type: none"> ▪ Calculations ▪ Anchors ▪ Components ▪ Attachments ▪ Inspection, Safety Plan, Test <p>ROMO Safety Factor: <i>All Rigging</i> = 5 : 1</p> <p>Volume: Circles = πr^2, Cylinders = $\pi r^2 \times L$(length) Squares/Rectangles = Length x Width x Depth</p> <p>Approx. Weights: Granite = 170lbs per Cubic foot</p> <p><i>Weight per linear foot:</i> Doug Fir: 24.7(gr), 17.7 (dry) based on 8"-10" dia Spruce: 21.7 (gr), 16.4 (dry) Pines: 19.6 (gr), 16.1 (dry)</p> <p>Coefficient of Friction: Rock on Dirt = 8%</p> <p>%Grade = Vertical Rise x 100 ÷ Horizontal Run.</p> <p>To find # of Pads and Pad length: determine rise and run of section in inches. Divide the rise by step height to find # of steps. Divide run by # of steps—<u>plus one</u> to find pad length in inches.</p>

JSA Instructions

The JSA shall identify the location of the work project or activity, the name of employee(s) writing the JSA, the date(s) of development, and the name of the appropriate line officer approving it. The supervisor acknowledges that employees have read and understand the contents, have received the required training, and are qualified to perform the work project or activity.

Blocks 1, 2, 3, 4, 5, and 6: Self-explanatory

Block 7: Identify all tasks and procedures associated with the work project or activity that have potential to cause injury or illness to personnel and damage to property or material. Include emergency evacuation procedures (EEP).

Block 8: Identify all known or suspect hazards associated with each respective task/procedure listed in block 7. For example:

- a. Research past accidents/incidents.
- b. Research the Health and Safety Code or other appropriate literature.
- c. Discuss the work project/activity with participants
- d. Observe the work project/activity
- e. A combination of the above

Block 9: Identify appropriate actions to reduce or eliminate the hazards identified in block 8. Abatement measures listed below are in the order of the preferred abatement method:

- a. Engineering Controls (the most desirable method of abatement). For example, ergonomically designed tools, equipment and furniture.
- b. Substitution. For example, switching to high flash point, non-toxic solvents.
- c. Administrative Controls. For example, limiting exposure by reducing the work schedule.
- d. PPE (least desirable method of abatement). For example, using hearing protection when working with or close to portable machines (chain saws, rock drills, portable water pumps)
- e. A combination of the above.

Block 10: The JSA must be reviewed and approved by a supervisor.

Block 11: List all recommended and required PPE relevant for job/activity.

Emergency Evacuation Instructions

Work supervisors and crew members are responsible for developing and discussing field emergency evacuation procedures (EEP) and alternatives in the event a person(s) becomes seriously ill or injured at the work site.

Be prepared to provide the following information:

- a. Nature of the accident or injury (avoid using victim’s name).
- b. Type of assistance needed, if any (ground, air or water evacuation).
- c. Location of accident or injury, best access route into the work site (road name/number), identifiable ground/air landmarks.
- d. Radio frequency(s).
- e. Contact person.
- f. Local hazards to ground vehicles or aviation.
- g. Weather conditions (wind speed & direction, visibility, temp).
- h. Topography.
- i. Number of person(s) to be transported
- j. Estimated weight of passengers for air/water evacuation.

The items listed above serve only as guidelines for the development of emergency evacuation procedures.

JSA and Emergency Evacuation Procedures Acknowledgement

As supervisor I acknowledge that the following employees have participated in the development of this JSA, accompanying evacuation procedures and have also been briefed on the provisions thereof:

Supervisor’s Signature:
