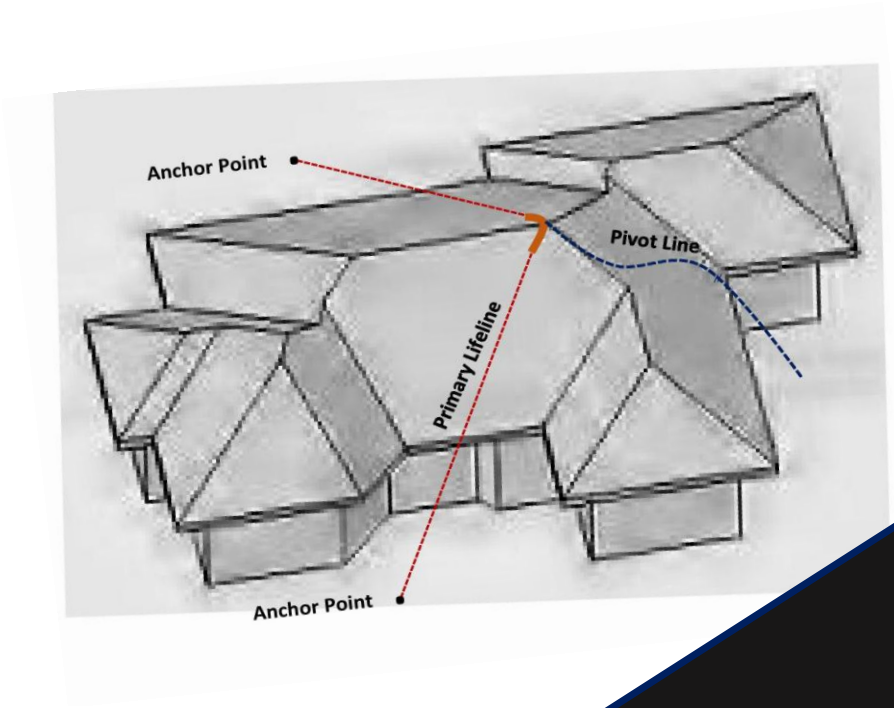
Reality Rope Access LLC

Rope Access Training for Pitched Roofing Systems



ACRABAT
Association for Certified Rope Access Building Assessment Technicians

Rope Access Training for Pitched Roofing Systems

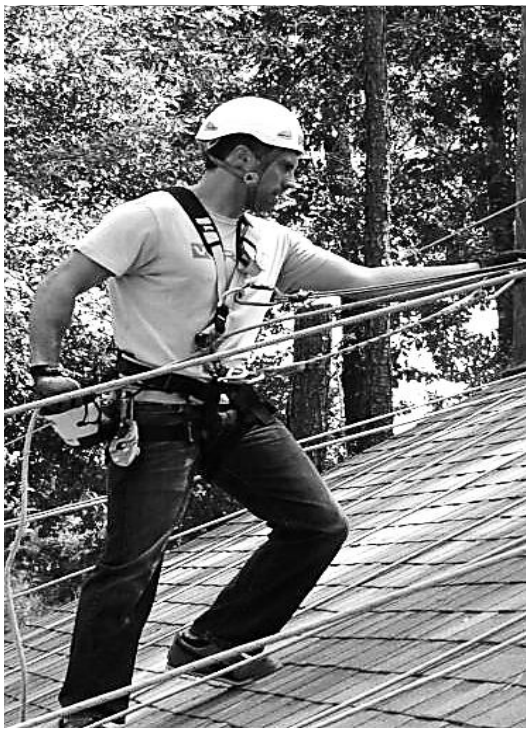


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TABLE OF CONTENTS

Chapter 1

Introduction

All roofing systems require occasional access for reasons that do not necessarily pertain to the act of major reconstruction. For the Home Inspector, assessing the integrity of a roofing system represents a critical component of their job that requires the proximity of a hands-on approach to accurately complete. Direct access needs like this that require a first man up fall protection system are also represented in the industries of Property Insurance Claims, Roofing Sales, Solar Power, Satellite Communications, as well as general roofing maintenance.

WARNING:

The information contained within this document is intended for use as a supplement to actual hands-on / experiential training conducted by a Competent Trainer. This document may contain errors resulting from the mistakes of the authors and/or the people with whom they consulted. Improper interpretation and/or misuse of this information may result in incident, injury or fatality. No liability for loss or damage, direct or consequential, to readers or others from the use of information contained herein will be assumed by Reality Rope Access LLC, its administration, members, partners, or contributors.

Document Purpose:

This document is intended to serve as a supplemental educational guide for Pitched Roofing Rope Access Trainees and as a field guide for those who have completed an approved rope access training program.

Safe Access Philosophy:

Most roof structure access accidents can be prevented by:

- Understanding the inherent risks associated with direct access roof system inspection.
- Providing a complete training program on pitched roof access safety procedures.
- Insisting on the appropriate selection, use, inspection and maintenance of all personal safety equipment.
- Careful selection and management of properly trained workers with the appropriate equipment, attitude and skills.
- Workers taking responsibility for their own wellbeing by exercising their right to refuse work related duties that they believe to be unsafe.

Understanding the Essentials of Rope Access

What Is Rope Access: Rope Access is in a sense the fusion of Fall Arrest, Fall Restraint and Work Positioning systems. It is a process that utilizes ropes for support, positioning and safety as a cost effective means for the most complete human access of difficult-to-reach areas.

Who Is IRATA: IRATA (The Industrial Rope Access Trades Association) is a UK based professional association that formally established Rope Access as a form of fall protection in the late 80s for the Offshore Oil Industry.

Who Is SPRAT: SPRAT (The Society for Professional Rope Access Technicians) is a North American based professional association that emerged in 1996 with the fundamental goal to advance the safe use of rope access through education, developing standards, and administering certifications. SPRAT's crowning achievements include educating state and federal OSHA officials on the merits of Rope Access as a credible, essential form of fall protection and the creation of "Safe Practices for Rope Access Work", a document that is viewed today as the most valid set of standards for the completion of rope access work.

Who Is ACRABAT: ACRABAT (The Association of Certified Rope Access Building Assessment Technicians) was created in 2008 by Property Claims Adjusters who were fed up with the increasing personal risks associated with inspecting aggressively pitched roofing systems of the modern housing industry. Their goal is to promote uniformity standards by developing professional consensus on pitched roofing system rope access for front line workers, the organizations who train them and the companies that employ them. ACRABAT's crowning achievement is "Rope Access Standards for Pitched Roofing Systems" the only set of standards for the use of rope access systems on pitched roofing structures.

Who is OSHA and What Is Their Opinion of Rope Access: The Occupational Health and Safety Administration (OSHA), was created in 1971 from the US Department of Labor in an effort to reduce workplace incidents, injuries and fatalities. OSHA regulations ARE LAW. Employers who are not in compliance with OSHA regulations can be subject to penalties of law. (e.g. "General Duty Clause" citation - the failure to provide safe working conditions for employees). Rope Access is not formally recognized within OSHA 1926.500 standards for fall protection however, OSHA officials (much in part to the efforts of SPRAT) now recognize rope access as a valid form of fall protection under what is known as a variance.

Who is ANSI and What Is Their Opinion of Rope Access: ANSI (The American National Standards Institute) is a private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States. Rope Access is recognized by ANSI as a valid means for Fall Protection under the ANSI standard Z359.8 "Rope Access Systems".

Chapter 2

Definitions

Access Zone – the area in which people are at risk of falling such as on-rope or near a working edge. This area requires protective measures such as verbal warnings, signs, barriers, safety lines, or other devices designed to prevent or arrest a fall. *(SPRAT "Safe Practices for Rope Access Work" 2.2)*

Anchor – a critical component of support within a rope access system utilized as a secure point to attach a lifeline.

Active Anchor – the anchor(s) that the rope access worker is currently using to secure their position along a lifeline.

Anchor, fixed – a secure point or combination of load sharing points fixed to the earth or structures that meets the strength required for a rope access system.

Anchor, load sharing – several anchors connected together to make a single anchor that meets the strength required for a rope access system.. *(SPRAT "Safe Practices for Rope Access Work" 2.4.4)*

Anchor, weight based - a secure point of attachment consisting of weight encapsulated / contained / securely attached to by a load rated system of connectors and/or nylon cordage, that meets the strength required for rope access work on a pitched roofing structure.

Ascender – a belay device best suited for climbing upward by gripping a rope when loaded in one direction and sliding freely in the opposite direction when pushed forward.

Authorized Person – an individual who has the approval of their employer to perform duties at a location where they will be exposed to high angle fall hazards. *(ANSI Fall Protection Code Definition 2.11)*

Belay – the act of securing a worker to a lifeline for the purpose of fall protection.

Attended Belay – a belay system consisting of a moving lifeline that passes through a belay device operated by a second person.

Self-Belay – a belay system operated by the climber that allows for mobility along a fixed lifeline.

Belay Device – a critical component (equipment or hardware) of a rope access system. A piece of equipment designed to secure a climber to a lifeline.

Belay Transfer – the act of transitioning from one rope access anchor system to another. Most commonly known in pitched roof rope access as the action performed by an ascending climber to re-orient their belay system to a new anchor while transitioning over a ridge cap in order to descend down a separate slope.

Body Harness – a nylon based system of buckles, straps and attachment points that encapsulate both the upper and lower torso. Body harnesses should be designed for both the comfort of a suspended worker in mind and for the even distribution of arresting forces across the worker's chest, shoulders, waist and thighs.

Carabiner – a form of connector consisting of a complete loop with a spring-loaded entry gate. *(SPRAT "Safe Practices for Rope Access Work" 2.8)*

Carabiner, locking – a carabiner with a mechanism that reduces the possibility of a gate being opened inadvertently. *(SPRAT "Safe Practices for Rope Access Work" 2.9)*

Competent Person – an individual designated by the employer to be responsible for the immediate supervision, implementation and monitoring of the employer's managed fall protection program who, through training and knowledge, is capable of identifying, evaluating

and addressing existing and potential fall hazards, and who has the employer's authority to take prompt corrective action with regards to such hazards. *(ANSI Fall Protection Code Definition 2.30)*

Competent Trainer – a person with the appropriate training, education, knowledge and experience, capable of delivering a quantifiable educational program in a safe and effective manner to other rope access personnel.

Connector – a device (ex. carabiners, snap hooks, rapid links) used to combine components of a rope access system.

Climber – a term used to describe a rope access worker who may be ascending or descending a rope or structure.

Descender - a manually operated belay device best suited for controlled downward movement along a lifeline.

Energy Absorber / Shock Absorber – a component of a personal fall arrest system designed to dissipate / limit shock related energy to the human body imposed during the fall arrest process.

Fall Factor – the maximum distance a person could fall, divided by the length of the rope attaching to the anchorage point. *(SPRAT "Safe Practices for Rope Access Work" 2.14)*

Fall Protection System – any equipment, device or system that prevents an accidental fall from elevation or that mitigates the effect of such a fall. *(ANSI Fall Protection Code Definition 2.67)*

Fall Arrest System – a fall protection system that is designed to arrest the fall of a worker in a manner that mitigates and/or prevents injuries produced by forces of shock and structural impact.

Fall Restraint System – a fall protection system that is designed to prevent the possibility for a fall by keeping workers from entering an area where the risk of a fall exists.

Rope Access System – a fall protection system that is used as a means of accessing structures or areas that would otherwise be either impossible or impractical to reach with scaffolding or the use of other forms of fall protection.

Work Positioning System – a fall protection system that is designed to secure and stabilize a worker, standing, balancing on or leaning against a slope or structure, in a manner that allows them to complete hands-free work.

First Man Up Fall Protection System – A system of fall protection that can be set-up / put in place by a worker, without any exposure to the risk of a fall.

Hazard Zone – any area where a person may be at risk as a result of the work being performed. *(SPRAT "Safe Practices for Rope Access Work" 2.16)*

Incident – an unplanned or unintentional occurrence that produces significant threat to personal injury or property damage. Sometimes referred to as a close call or near miss.

Job Hazard Analysis / JHA – A written statement prepared by the rope access worker and/or employer that outlines job specific health and safety issues required to minimize the threat for injury to self and others.

Kernmantle Rope – Synthetic rope with a load bearing core (kern) and a woven protective cover (mantle).

Dynamic Kernmantle Rope – a rope with greater than 10% elongation potential at 10% of its minimum breaking strength.

Low Stretch Kernmantle Rope – a rope with greater than 6% and less than 10% elongation potential at 10% of its minimum breaking strength.

Static Kernmantle Rope – a rope with less than 6% elongation at 10% of its minimum breaking strength.

Ladder Stabilizer – any device designed specifically by manufacturer to enhance a ladder's resistance to the forces of kick-out and/or lateral motion during roof access use.

Lanyard – a component of a rope access system consisting of a flexible rope, flat cordage strap or webbing typically utilized to attach a lifeline or harness to a connector, arrestor, energy absorber or anchor.

Lifeline - a component of a rope access system consisting of rope cordage secured on or over a structure by at least one anchor point.

Line Placement – the act of pulling a main line or main line and safety line in place across the ridge cap of a pitched roof structure through the use of a tag-line system

Lock In – the process of locking belay device(s) so that worker can begin hands-free work on structure.

Low-Slope Roof – a roof having less than or equal to 4 in 12 (vertical to horizontal) slope. (OSHA 1926.500 (b))

Main Line – the primary rope used for ascending, descending or positioning. *(SPRAT "Safe Practices for Rope Access Work" 2.20)*

Minimum Tensile / Minimum Breaking Strength – An expression of foot pounds that represents the point where individualized equipment components begin to fail based on testing results listed by the manufacturer.

Newton / Kilonewton – a unit of force listed in the SI system (The International System of Units), which is comparable to pounds of force (lbf) in the US System. 1 kilonewton (kN) = 1000 newtons = 224.8 lbf.

Participant – an individual student or trainee taking part in an instructor facilitated rope access training program.

Personal Protective Equipment (PPE) - refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury.

Pivot Line - a component of a rope access system consisting of rope cordage attached to a main line or main line and safety line that is secured by at least two anchor points for the purpose of allowing for rope access secured work to take place away from the primary lifeline.

Primary Belay Device – a belay device that serves as the primary means by which a climber is secured to a lifeline.

Qualified Person – an individual who, by possession of approved professional standing, recognized degree, extent of knowledge, training and experience in the field of fall protection and rescue is capable of designing, analyzing, evaluating and specifying fall protection and rescue systems to the extent required by these standards. (ANSI Fall Protection Code Definition 2.129)

Rappel – the controlled descent down a roofing slope or building structure.

Redundancy – a procedure and/or device designed to serve as a fail-safe back up process to all primary components (as determined by a qualified person) of a rope access system. Redundancy is intended to address issues that present the possibility of failure primarily associated with user error.

Rescue – the act of safely moving a stuck, incapacitated or incapacitated and injured worker back to the position of autonomous mobility or to a position where definitive medical care can be administered.

Rescuer – a person performing a rescue other than the rescue subject of a rescue. *(SPRAT "Safe Practices for Rope Access Work" 2.24)*

Pick-Off Rescue – the act of worker retrieval via rope access by a rescuer who will approach, attach to and descend with an incapacitated casualty.

Rescue Service – organization determined by the employer to be capable of safe and effective rescue of rope access workers.

(SPRAT "Safe Practices for Rope Access Work" 2.25)

Retrieval Rescue – procedure for rescuing rope access workers without placing a rescuer on-rope. *(SPRAT 2.26)*

Retrieval System – the equipment used for rescue of rope access workers without placing a rescuer on-rope. *(SPRAT "Safe Practices for Rope Access Work" 2.27)*

Self Rescue – the incorporation of equipment and techniques necessary for a rope access worker to regain mobility along a lifeline following an incident.

Risk Management – is the identification, assessment and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor and control the probability and/or impact of unfortunate events. *(Wikipedia)*

Safety, or Backup Line – rope used as a secondary line of defense against falls should the main line, anchor or belay device fail.

Safe Working Load (SWL) – manufacturer's designated maximum working load given a certain / particular set of environmental or situational conditions.

Shall – the word "shall" is to be understood as denoting a mandatory requirement.

Shear Reduction - the act of selecting, combining or employing components or naturally occurring elements to reduce the cutting force of cordage by increasing the bend radius over which the cordage is subject to.

Shock Loading – a sudden or unexpected load that is imposed upon a lifeline system that exceeds the working load limit of its components.

Should – The word "should" is to be understood as advisory, or a recommendation.

Tag-Line System – a tool or collection of tools employed from ground level to position a lifeline in place across an object or structure.

Working Load Limit (WLL) – represents the maximum allowable load (as determined by the manufacturer) that a piece of equipment is designed to suspend, hold, raise, lower etc. Working load limits define the boundaries of force that all load rated rope access equipment should operate within in order to avoid damage or compromise.

Work Zones – physical work site areas that correlate to the proximity of the rope access work that is taking place.

Access Zone – Represents the area where rope access techniques are required.

Hazard Zone – Represent area where general public is at risk for injury from the work being performed (i.e. dropped tools).

Safe Zone – any area outside the hazard zone or access zone. *(SPRAT "Safe Practices for Rope Access Work" 2.33)*

Chapter 3

Rope Access Personnel

It is important to note that not all people are created equal with respect to fulfilling the physical and psychological demand requirements of a pitched roof rope access worker. Proper selection of rope access personnel is a critical component to developing any risk managed rope access program.

Recommended Qualifications:

- Healthy respect for heights yet void of any height related phobias
- Good strength-to-weight ratio
- Good levels of cardio fitness
- Willingness to learn and follow protocol
- Capable of producing rational thought during stressful situations

Limitations / Concerns

- Obesity
- Diabetes or Circulatory Problems
- Irrational fears
- Extreme sensitivity to Sunlight
- Severe allergic reaction to insect b
- Back, neck or shoulder problem

Roles, Responsibilities, T
Evaluation of Pitched R
Workers:
Rope access in ge
very broad range o
industrial world (
bridges, tower
Pitched roof r
hand is ver
of a sing
training
roof r
com
IF

Level I – Rope Access Technician (Pitched Roof Rope Access Worker): an individual with the appropriate abil skills and training to complete rope ac operations on pitched roofing system ANSI definition for "Authorized Pers

Duties and Responsibiliti Authorized Person:
The Level I worker should:

1) have the appropriate training required pitched roofing s
2) have a wor employer's procedure
3) possess skills.
4) be th
5)

Cut-Away

Chapter 4

Rope Access Programs

Managing the risk of any work-at height program requires much more than simple training. The ability to access practically any aggressively pitched roofing structure and the elimination of practically all credible threats to worker safety is an attainable goal but not without the appropriate program implementation provided by qualified leadership.

Standards are the foundation of successful fall protection programs. Good standards are written on a living document that evolves into better standards with time, information and professional consensus. There is little debate as to the effectiveness of ANSI Z359 "Fall Protection" standards that have proven time and again to be the most direct path to developing sound fall protection program protocol.

Note: Contributions from the Society for Professional Rope Access Technicians (SPRAT) play a significant role in the ongoing development of ANSI standard Z359.8 *"Rope Access Systems"*.

Guidelines represent a recommended outline of how specific tasks should be carried out. SPRAT Level I training programs provide a good example of how rope access is carried out within the very broad playing field of the industrial world. Guidelines such as those presented within this document illustrate how standard compliance can be achieved within a specific field of practice.

Proper Training:
Critical training components include:

1. "First-Man-Up" Fall Protection Systems
2. Identification and Appropriate use of Anchors
3. Rope Access System Assembly
4. Appropriate Ladder Selection, Set-up and Use
5. Aggressive Slope Mobility
6. Slope to Slope Belay Transfers
7. Pivot Line Assembly and use
8. Rescue Response

Work Planning represents work-site protocol that includes:

- the identification of state and federal worksite regulations
- selection and use of rope access equipment
- selection and use of personal protection equipment (PPE)
- contact information
- communication procedure
- work zone procedure
- Job Hazard Analysis (JHA)
- rescue plans

Qualified Leadership provides for the appropriate orchestration of a risk managed rope access program. Appropriate leaders should:

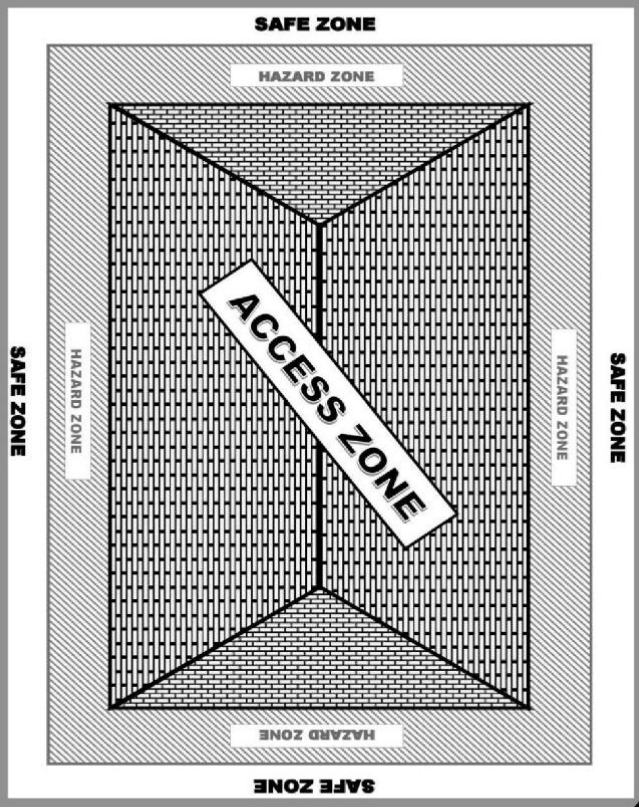
- establish and maintain open lines of communication with rope access workers
- hold regular safety meetings
- establish system of evaluation and training of rope access workers
- provide field assistance to rope access workers as needed
- ensure work plan compliance

Work Zones

Pitched roof rope access work site zones:

- **SAFE ZONES** – Represent areas where the general public is clear of the risk for injury from the work being performed.
- **HAZARD ZONES** – Represent areas where general public is at risk for injury from the work being performed (i.e. dropped tools).
- **ACCESS ZONES** – Represents the areas where fall protection, fall restraint, rope access techniques are required.

PLEASE NOTE: Extreme caution should be exercised when working within six feet of roof system rake or eave. Rope Access Workers who are within this area are at risk of a fall that could put them over the leading edge and into a position of vertical suspension or worse.



Pitched Roof Rope Access Work Plan

Company Name	Company Contact Rep	Company Contact Phone #	Today's D

Project Name	Sta

Host Name	Host Contact Rep	Host Phone #

Contact Office Location	Work Site Location

Rope Access Personnel

Position	Name & Signature	Cell Phone & E-mail	Certification & Trair Status
Rope Access Supervisor			
Technician			
Technician			
Technician			
Other			

Work Site Emergency Ir

Local EMS Contact Info

Process For Wo

Description of Work **Example:** Scope, photo, diagram

Rope Access Methods **Example:** Rope Access Guid
man teams

Individual Rope Access Equipment **Example**
secured Jumar to central D connection, Rig or S
point at sternal D., Min. 200 ft 10.5 – 11.5mm
protector sleeve, edge protection, two 12'
aluminum two-stage connectors, minim

Team Equipment **Example:** 16', 2

Individual Personal Protective

Ladder Selection & Use **Exa**
through rails used for all roof

Work Tools **Example:** ta

Means to Secure Wor
harness, clip board sh

Means to Secure
unauthorized us

Means to Se

Anchor Se
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Cut-Away

Chapter 5

Ladders

A Ladder is the most necessary and hazardous of all tools used by those who must access pitched roofing structures. Statistics published by the U.S. Consumer Products Safety Commission show that nearly 165,000 Americans are treated for ladder-related injuries every year. For most industries, ladders are viewed as a very dangerous tool to be avoided if at all possible. Fixed ladder systems can incorporate cages and / or belay cables to protect workers from falls yet the most preferred means of ladder related fall protection is to engineer out the need to use them all together. Unfortunately, these types of fall protection strategies are simply not an option for most residential roof structure access issues.

Ladder Assisted Roof Access Risk Contributors	
#1	**Risk:** Safe ladder use goes way beyond that of common sense.
	Explanation: Ladders are simple looking tools that become extremely complex once you introduce the dynamic load of a moving body. Combine this fact with the infinite combinations of contact surfaces that the ladder will be positioned on, and the probability of a ladder related incident or injury becomes practically unavoidable.
#2	**Risk:** Incomplete and ineffective ladder use safety training protocol.
	Explanation: Most ladder safety training is either classroom or computer based and offers no hands-on experiential component. Neither classroom nor computer based ladder safety curriculum alone can guarantee the comprehension of material presented. Effective ladder safety protocol requires training that includes an experiential component and demonstrated skills testing to verify worker comprehension.
#3	**Risk:** There is no ladder available on today's market that can be used for pitched roofing system access in a manner that is consistent with manufacturer's safe use recommendations.
	Explanation: All portable ladders are multi-use ladders; some portable ladders are designed with more purposes in mind than others but **there is no ladder that is designed for the sole purpose of roofing access**. Safe ladder use recommendations provided by the manufacturers of portable ladders clearly indicate that the user must keep their body inside the ladder rails at all times yet roofing access requires user to disregard this rule when they transition from ladder to roof.

Ladder Selection

Ladders are tools and all tools should be selected on the basis of relevance to their intended purpose.

Ladder selection should be based on safety: While it is true that no ladder should be regarded as "safe", it is also true that some ladders are inherently much safer than others. The best fall protection criteria for selecting a roof structure specific ladder requires:

a) a duty rating greater than the weight the user intends to load it with. *This will require consideration for the weight of others who might use it as well.*
b) the appropriate length for the roof structures the user intends to access. *This will normally require the user to purchase more than one ladder.*
c) adjustable footing that provides for the greatest amount of traction on a variety of surfaces.(i.e. rubber soles for hard surfaces and metal cleats for soft ground surfaces like turf.)
d) compatible with ladder accessories that transform it for roof structure specific use. *Remember that no stock ladder available on today's market is specifically designed for roofing structure access.*

Ladder selection should <u>NEVER</u> be based on convenience: If the top selection criteria is convenience, the intended user: might choose a ladder that fits into a suitcase, can be transport inside the trunk of a midsize car, is light weight and easy to carry, is low cost or may even choos make do with a ladder that they already own. The price of convenience is in short nothing less compromise of user's personal safety.

Why Extension Ladders Represent the B Choice for Roofing Structure Acces

Types of Ladders	Available in Lengths of 12' to 60'	Adjustable in Increments of One Foot	Adjustable Footing w/ Rubber Pads & Cleats	Compatible fo Use w/ Ladder-M Stabili
Articulated Ladder	NO	SOME	NO	M
Extension Ladder	YES	YES	YES	
Telescoping Ladder	NO	YES	NO	

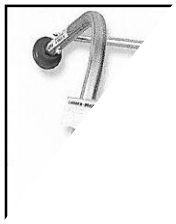
Ladder Accessories

Transforming an appropriately selected multi-use ladde structure access can be achieved with several produc engineered for this very purpose.

Ladder Extension Rails

Ladder extension rails like the "Guardian access that complies with ladder manufac rails at all times. Furthermore, these la by three feet (3ft).

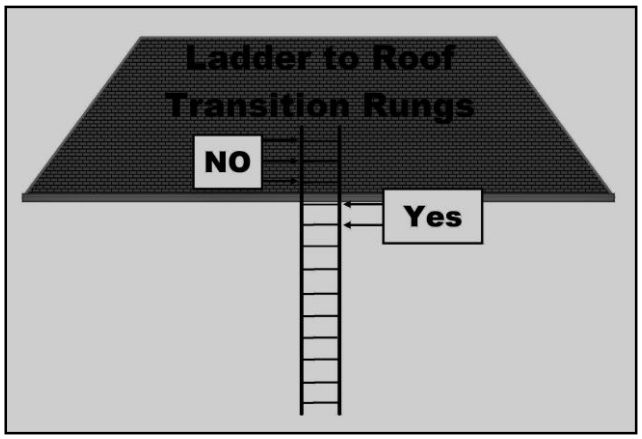
Cut-Away



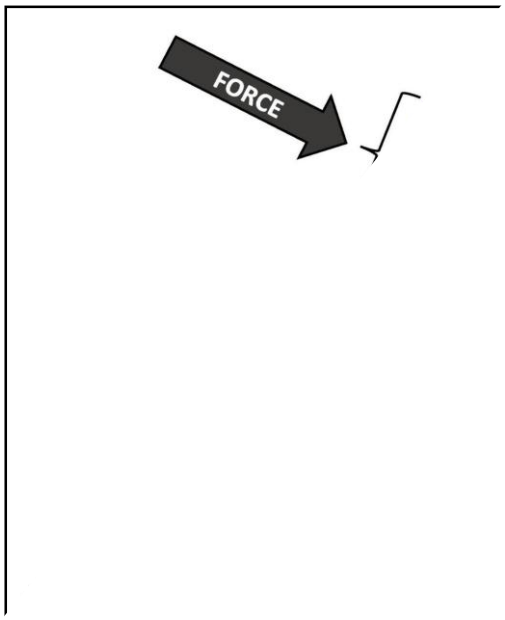
Ladder they s indu

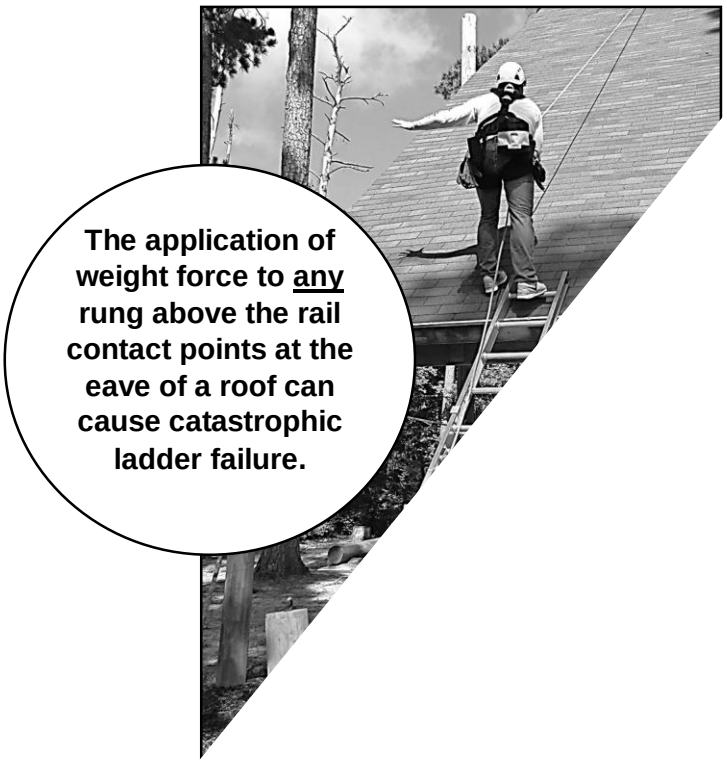
Ladder Kick-Out

Kick-Out is the number one reported cause of roof structure ladder access related injuries. Kick-Out occurs when the dynamic forces applied to the ladder exceed traction of the ladder's footing. The risk of kick-out can be greatly reduced by securing the base footing of the ladder and avoiding weight force application to the ladder rungs positioned above the roofing structure's eave line.



The transition from ladder to roof / roof to ladder is an extremely delicate procedure that requires a tall side-step from a ladder rung positioned beneath the roofing structure's eave line. Any force applied to the ladder rungs positioned above the eave line can generat potentially catastrophic horizontal force a base of the ladder.





The application of weight force to <u>any</u> rung above the rail contact points at the eave of a roof can cause catastrophic ladder failure.

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Rope Access Equipment

Introduction

Properly functioning equipment is a critical component to any managed fall protection program. The most valid information on equipment selection, use, care, maintenance and retirement will always be that which comes straight from the equipment manufacturer. Rope access system equipment in general is designed to withstand many times the weight of the average human body however, is not without limitations. Though extremely rare, equipment failure is almost exclusively attributable to user action that deviates from the manufacturer's safe use recommendations.

WARNING:

Sport climbing systems, standards and process are radically different from those which are used for rope access. Most sport climbing equipment:

- does not meet state or federal regulation requirements for use as fall protection
- is not condoned by manufacturers for use within a rope access system.

Governmental Regulations OSHA and ANSI Consensus Standards

- Federal OSHA regulation 1926.502 (Construction) and 1910.66 (General Industry) indicate that the user of the fall protection equipment shall inspect each component of the system prior to use.
- State regulations on equipment inspection at the very least operate within the framework of Federal regulation yet are quite often more stringent in nature. Some of the newest regulation from the State level indicate that the user must comply with both ANSI & manufacturer requirements.
- ANSI standards for all equipment components of a fall protection system is that inspection shall be completed by user prior to use and that an inspection by a competent person shall take place annually.
- Manufacturer's requirements for equipment inspection will vary with manufacturer and individual components. Most equipment manufacturers are very clear with respect to how their equipment is to be used, inspected and maintained. It is of critical importance that both competent person and authorized worker understands and follows this information.

Full Body Harness

Are selected to be uniquely suited to the needs of the rope access worker. Full body harnesses such as the one pictured in figure 6.1 provide a number of features that include:

- Compliance with voluntary standards and governmental regulations for fall protection
- 5 different 5000lb rated attachment points that provides compatibility with a variety of equipment and use within multiple forms of fall protection systems
- Attached chest ascender
- Integrated chest and seat components that encapsulate and prevent workers from falling out of their harnesses
- Attachment points to secure tool bags and additional equipment

Design for comfort and the appropriate load distribution of technician's weight while working or when arresting a fall.

Harnes

Harness inspectio	
Hardware	**W**
Check buckles and D-rings for corrosion, cracks, buckling and sharp edges caused by excessive wear	Chec te
A Body Harness damage or defe	
A Body Harr manufactur service.	
A Body	
User is r	

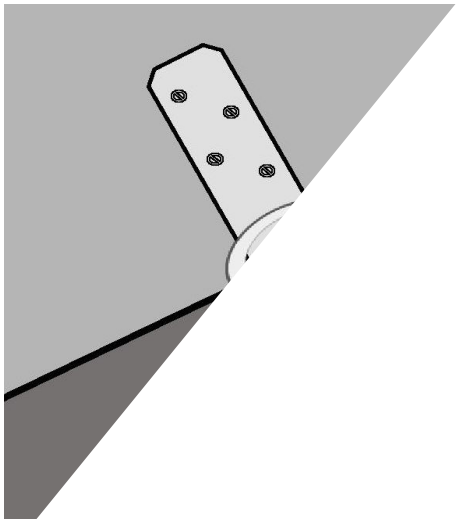
Cut-Away

Anchors

An anchor is a critical component of support within a rope access system utilized as a secure point to attach a lifeline. The selection and application of appropriate anchors is quite possibly the most critical of tasks required of any rope access worker. Finding suitable anchors represents a major challenge to building a rope access system as most roofing structures are not designed and built with future rope access worker's needs in mind.

Rope access anchors should be strong enough to support at least two times the maximum anticipated dynamic load. OSHA requirements for a personal fall arrest system is 5000 lbf (pounds of force). Considering that pitched roof rope access will require the safety provided by a personal fall arrest system at the ladder, eave or ridge cap where a 6 ft fall is possible, it only makes sense to incorporate a 5000 lbf anchor whenever the situation allows.

Roofing type anchors could be used if properly secured to roof structure however, they do not offer a safe solution for the initial ascent up "First Man Up") the pitched roof system.



Fixed anchors include all objects and structures that are either man made (e.g. fencing, decking, framing members) or naturally occurring (e.g. trees, shrubs etc.) that are appropriately positioned and capable providing appropriate levels of lbf resistance

Cut-Away

Chapter 8

Knots and Hitches

Knots and hitches are of critical importance to the process of rope access that require the skilled hands of the appropriately trained worker.

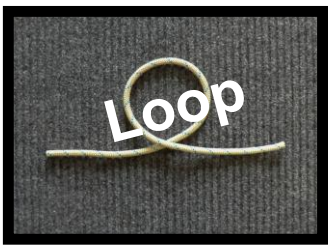
Effective knots are never chosen at random but in fact selected as the most beneficial for their intended purpose. This could include:

- Residual Rope Strength – *(i.e. remaining tensile strength of rope after knot is applied)*
- simplicity to tie.
- simplicity to untie once subject to a dynamic load.
- direction of load to be applied to it.
- means by which it can be connected to another object.
- location along a rope it can be created…

NOTE:

- Knots will reduce the overall breaking strength of a rope by up to 40%.
- Knots should be tied with at least four inches of tail.
- An appropriately dressed knot *(i.e. a neat, orderly knot free from unnecessary twists or bends)* maintains greater strength and is easier to identify.

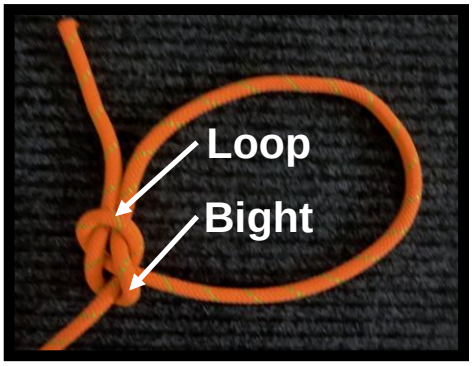
All Knots broken down into their simplest form are nothing more than loops and bights:



Overhand Knot:

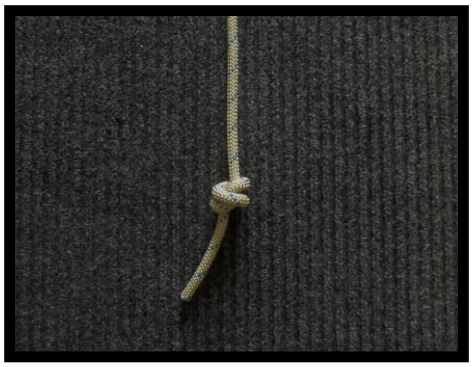
The Overhand knot is nothing more than a loop with one end of the rope passed through it. *Essentially the very simplest type of knot on record.*

Bowline Knot:



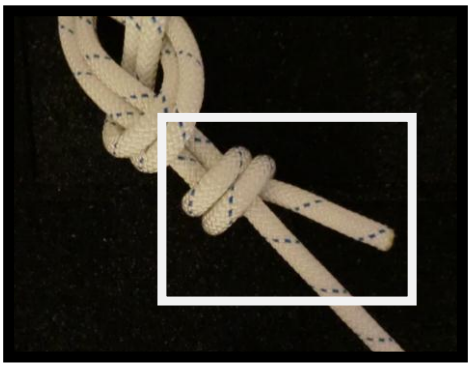
A Bowline is a no-slip knot that contains both a loop and a bight.

Stopper Knot:



A Stopper knot is a double loop knot used to prevent a climber from descending past the end of their rope.

Double Overhand Locking Knot:



A Double Overhand Locking knot is a slip-knot commonly used to secure a hitch or another knot in place.

Scaffold Knot:

A Scaffold knot is essentially a double overha knot that has been applied to a bight of rop

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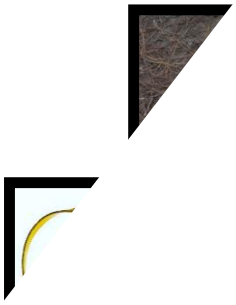
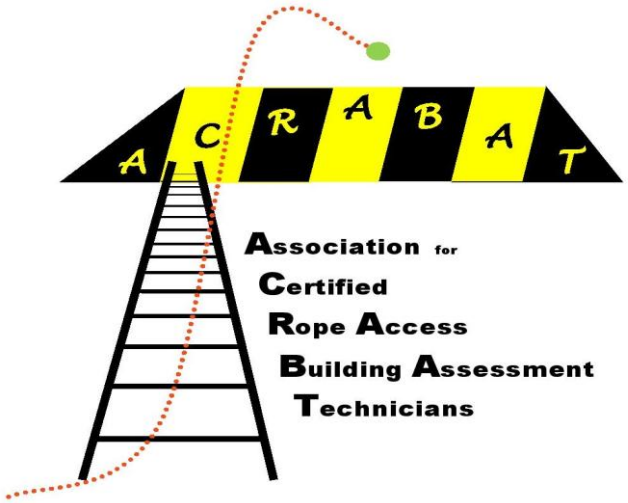


Cut-Away

This document is without question the most complete collection of information for rope access on pitched roofing structures.



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