PACIFIC ROPES TRAINING MANUAL

Pacific Ropes™

ACCESS THROUGH INNOVATION

Name:

Course Date:

DISCLAIMER

The information contained in this rope access training manual does not take precedence over Provincial Occupational Health and Safety acts and regulations. Nor does it take precedence over IRATA or SPRAT standards and regulations.

Where conflict between the manual and Provincial Regulations occurs, Provincial Regulations will be the standard used, except where the standard of our procedure is greater than a specific Provincial Regulation.

Where conflict between the manual and IRATA Regulations occurs, IRATA Regulations will be the standard used.

Where conflict between the manual and SPRAT Regulations occurs, SPRAT Regulations will be the standard used.

WELCOME
TO PACIFIC ROPES TRAINING ACADEMY

Congratulations on taking your first step towards becoming a qualified Rope Access Technician! This manual will help guide you towards obtaining either your IRATA and/or SPRAT level 1 Rope Access certification!

Pacific Ropes Mission

Pacific Ropes is committed to helping construction and energy sectors reach the inaccessible through excellent, safe and innovative custom solutions for work at height.

We Innovation

We are a dynamic solution provider.
We focus on solutions instead of problems.
We harness our team's diverse talents to think outside the box.

We Cultivate

We use our experiences as opportunities to learn and evolve.
We observe what others are doing well and learn from them.
We share our expertise with our community.

We Collaborate

We are here together until the job is done.
We listen and ask questions. We don't make assumptions.
We understand that collaboration is crucial to success.

We Prevent Risk

We prioritize risk management in all of our projects and training.
We are committed to excellence in following the highest safety standards set by the industry.
We train and mentor our team members and students to manage and control risk at all times.

This is our commitment to our students at Pacific Ropes.

CONTENTS

This manual (L2.2 (26) M4 L1 Training Manual) is to be used as a supplement to your training at Pacific Ropes Training Academy. This manual must also be used in conjunction with:

- IRATA International Code of Practice (ICOP)-Current Edition
- IRATA Training, Assessment and Certification Scheme (TACS)-Current Edition
- SPRAT Safe Practices For rope access work-Current Edition
- SPRAT Certification requirments/Evaluation Guidelines
- All of these can be found on the student Resources section of our website: http://info.pacificropes.com/student-resources

INTRODUCTION

Photo Credit: Ed Luke
Offshore, Denmark

Risk Assessment and Rescue Plan

Our training centers each have their own risk assessment and rescue plan. We will go over these before we get on ropes and they will be available for review throughout the week. This is good practice for when you start work on site. Your Supervisor or Manager will create a risk assessment for each work site. Remember to review these before starting any work at height!

Attendance

Before we begin each day of training, you'll need to sign our Daily Student Attendance Form. By signing in each day, you affirm that you have gone through our risk assessment and orientation, which is everything in this Introduction chapter!

Forms, forms, and more forms!

You need to fill out the following forms before jumping on rope on day 1. You have likely already filled them out during your online registration process, but if not please take the time to do that now!

- Registration form
- Media and Marketing Release
- Waiver and Release form
- Fitness Guidelines/Medical Statement

Logbooks

For candidates who are refreshing or upgrading, your IRATA or SPRAT qualification must be in date and you must show us your up to date logbook. More information on this will be covered in the next chapter. Remember that without this proper documentation, you run the risk of not being able to assess.

Fire

In case of fire, leave the classroom/training area and make your way to the muster point at the front of the building.

Smoking

Smoking is only allowed outside, away from any building entrances.
Take OFF your harness and other equipment please!

Helmets

Helmets must be worn within the training venue exclusion zone at all times. This will be covered in the risk assessment as well.

Washrooms

Washrooms are located behind the classroom. Please let us know if any toilet paper, soap, or paper towels need re-filling.

First Aid Kit

First aid kits are located on top of the fridge in the kitchen area. Any use of the First Aid kit will require an incident report/first aid form to be filled out and signed by the affected party.

Parking

Please park vehicles respectfully and ensure that your vehicle is not obstructing access to other office parking spots or dumpsters.

Training Equipment

Do not leave our equipment outside of the training center as they may get damaged or stolen. While you are training here, you will help us maintain our equipment and be responsible for anything that you use. You or your company will be liable for any damaged sustained to our equipment under these circumstances (leaving things outside). Unfortunately, due to our insurance requirements, you cannot use your personal rope access equipment. If you notice any damaged or defective equipment, please let us know immediately.

Personal Items

We have lockers available to use for your personal items. Please provide your own lock. We are not liable for anything damaged or stolen here.

Schedule

Training will begin at 8am and end around 4pm each day. You'll get a 45 min-1 hr lunch and on Assessment day, Pacific Ropes will provide a lunch for you. Please let us know of any dietary restrictions and allergies beforehand.

Kitchen

Feel free to make use of any utensils, equipment, supplies, coffee, tea, sugar, etc in our kitchen. Please don't mistake us for your personal dishwashers though! To help maintain a nice clean kitchen for everyone this week, please wash your own dishes.

Course Documents

In the Student Resources page of our website, you'll find a copy of this training manual, IRATA ICOP, IRATA TACS, SPRAT Safe work Practices and Certification Requirements, equipment info, and other useful information that you can access at home. You'll also get a hard copy of this manual. Hard copies of other documents will be provided during the course. However, please make sure you return them prior to the assessment.

Third Parties

Our training space is shared with other departments in our company. There will be other staff, contractors, suppliers, and visitors who may come in and out of the training space. Please be aware of third parties entering and leaving. Make sure you stay within the designated exclusion zones.

Rope Access Certifications

Industrial Rope Access Trade Association

- Based in the UK, established in the mid 80's.
- Global recognition for work opportunities.
- Have over 485 member companies. (as of April 2019)
- IRATA has trained in excess of 100,000 techs worldwide
- Progression to level 2 : 12 months experience + a minimum of 1000 logged rope hours.

Society of Professional Rope Access Technicians

- Based in North America, established in the mid 90's.
- Predominantly recognized in North America but quickly becoming recognized globally.
- Have over 150 member companies.
- Approx. 8000 trained rope technicians
- Progression to level 2: 6 months experience + a minimum of 500 logged rope hours.

Which one should you take?

IRATA certification is accepted globally, which is useful if you are planning on working outside of North America. There are also certain industries and companies that only hire IRATA certified technicians, even in North America.

SPRAT certification is often beneficial in building maintenance and wind industry. The reason for this is that within the SPRAT system level 2's are able to oversee a worksite. A SPRAT level 3 still would have overall responsibility, but does not necessarily need to be present if the scope of work is within the abilities of the level 2.

Asking yourself where you want to work and who you want to work for will help determine if you should take one certification or both. The SPRAT and IRATA L1 curriculum is similar for the most part and we cover both curriculum within the week so you can be exposed to both. All that said, if in doubt why not do both!? It's cheaper to do both in one week than to come back and do another full course if you decide to add another certification. (Limited options for this in Edmonton).

For more information on SPRAT or IRATA you can check out our blog post @ http://pacificropes.com/blog/

What is Rope Access

Rope Access is a safe and proven technique of accessing work sites usually inaccessible or too costly using conventional methods. Adapting equipment and techniques from the sport caving and climbing world, Rope Access continues to flourish within industry.

For a period of over 35 years, Rope Access for industrial purposes has been undergoing rapid development and change. Equipment has improved and training has become more professional and relevant to industry requirements.

Since the formation of IRATA (Industrial Rope Access Trade Association), Rope Access techniques have become an accepted method of working at height in various industries such as Civil Engineering, Oil & Gas, and Construction. Association guidelines and method statements have not only improved techniques, but also, and more importantly; improved standards of safety.

More recently, SPRAT formed in North America in order to address the needs of a growing number of companies and operators employing rope access techniques in North America. SPRAT's development of industry-consensus standards, including Safe Practices for Rope Access Work and Certification Requirements for Rope Access Work, not only raised the awareness of the safety and effectiveness of rope access systems, but also paved the way for California's Department of Industrial Relations effort to create one of the first laws sanctioning the use of rope access systems in North America. Since then, Alberta and New York City have followed suit with support from SPRAT and its members.

Throughout this course, *safety* will be the main priority of everything taught to you. It is the policy of Pacific Ropes Contracting that its' instructors teach you in a safe and easily digestable way. This is a strenuous course so work at your own pace and relax. Your instructors are highly experienced and are here for your convenience.

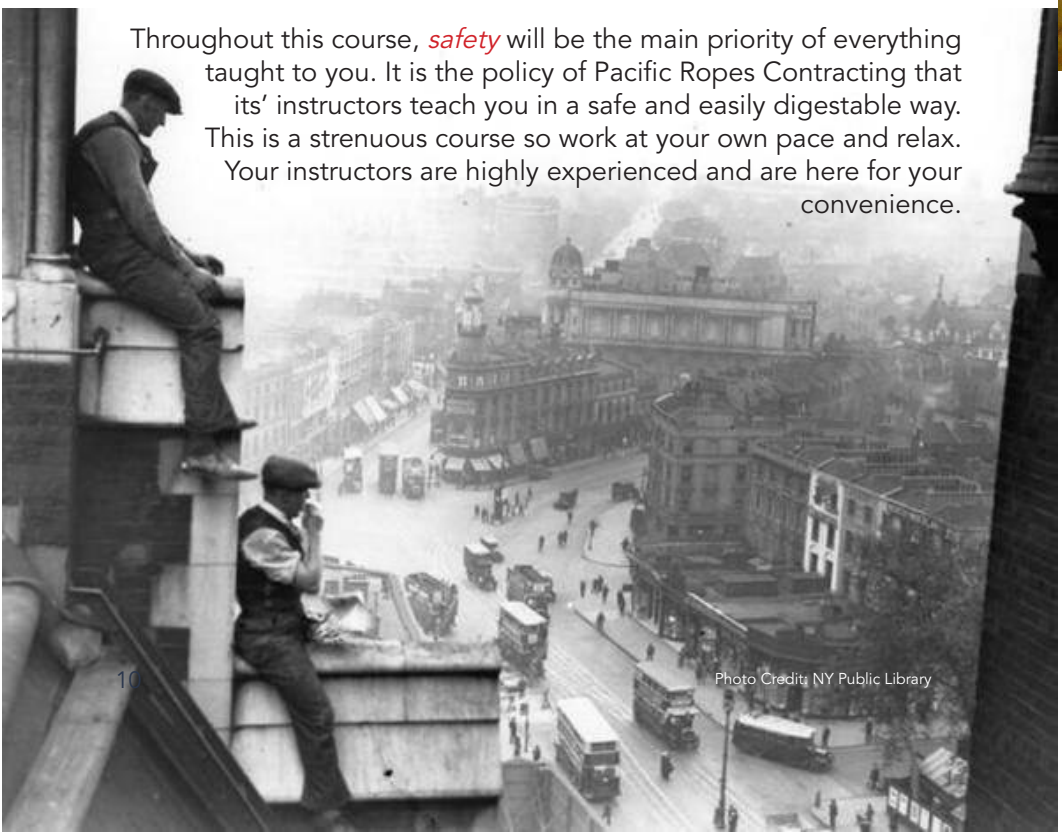


Photo Credit: NY Public Library

Photo Credit: Ed Luke
Offshore, Denmark

CHAPTER 1
QUALIFICATION

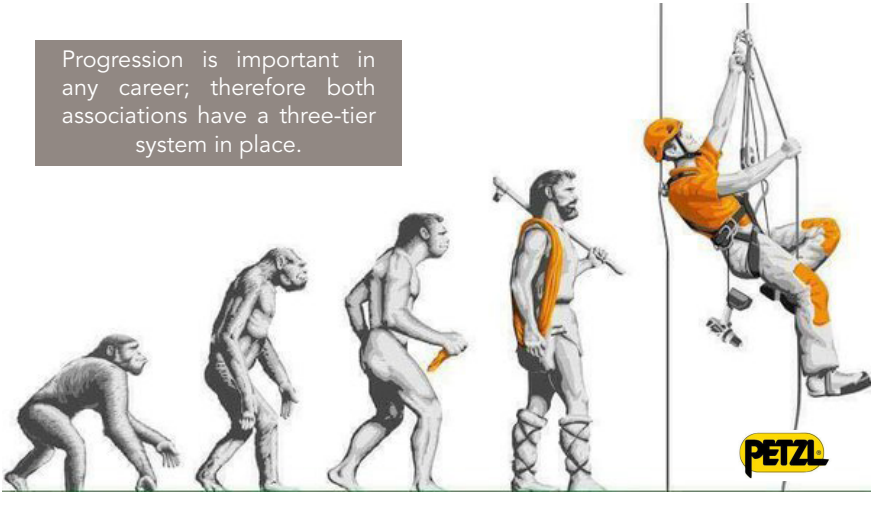
Rope Access Levels of Certification

Level 1 — This is You! Read through your manual to learn all you need in becoming a level 1 ROPE NINJA!

Level 2 — This is an experienced Rope Access technician who has all Level 1 skills plus more complex rigging, rescue and Rope Access skills. Level 2 technicians work under the supervision of a Level 3 Rope Access safety supervisor.

Level 3 — This is a Rope Access supervisor, who has the potential to take responsibility for work projects involving Rope Access. They are conversant with relevant work techniques and legislation and have a comprehensive knowledge of advanced rescue techniques. They should be able to demonstrate all the skills and knowledge required of Levels 1 & 2, hold an appropriate first aid certificate, and be familiar with the IRATA ICOP and TACS and/or the SPRAT Safe Working Practices and Certification Requirements. This level holds alot of responsibility as well as liability for the safety of the team and therefore should not be approached lightly.

Progression is important in any career; therefore both associations have a three-tier system in place.



As you gain more experience as Rope Access Technician, you are encouraged to progress up the ladder. This is not compulsory. It is perfectly acceptable to remain at your preferred/suited level.

Certification Flow Chart

This chart shows the requirements of progression through each system from level 1 to level 3. Advancement under the SPRAT system is more lenient and therefore a technician can obtain level 3 status quicker than under IRATA.

When re-certifying, you are able to attend a training course up to 6 months before your expiry date with no penalty. Meaning; you can keep the same expiry date, and not lose any time off your 3 year certification. This is a good idea to ensure you aren't left uncertified for any length of time if there is a high demand for training or other unforeseen issues arise.

Although IRATA and SPRAT are two separate associations, both level 1 syllabuses are very similar with only a few differences in terms of required skill demonstrations.

Here at Pacific Ropes, we will teach you everything required for both syllabuses, regardless of your choice of certification. More knowledge is always better!!!

IRATA LEVEL 1 DEFINITION

"This is a Rope Access Technician who is able to perform a specified range of Rope Access tasks under the supervision of a Level 3 Rope Access Supervisor. He/she is:

- Able to understand and follow the Rope Access procedures, method statements and associated risk assessments;
- Responsible for pre-use checks of his/her own Rope Access equipment;

- Able to assist in rigging and other operations, under the guidance of a higher grade;
- Able to undertake a simple rescue in descent, and assist in rescue operations."

SPRAT LEVEL 1 DEFINITION

"A person with the appropriate training, skills, and certification for performing, under the direct supervision of a Rope Access Lead Technician or Supervisor, standard Rope Access operations and, at a minimum, has the skills necessary to perform limited rescue from Rope Access systems."

AGE

If you're reading this and sitting in our classroom enjoying a nice mug of coffee, hopefully you are at least 18 years old. If not, we'll need to get you re-booked in until that eventful day arrives!!

MEDICAL REQUIREMENTS

Very Important!

In order for you to complete this course safely and successfully, you should be free of medical conditions and injury. If you're carrying an injury of any kind or suffer from any form of contra-indications or are on any medication (including an inhaler), please inform your trainer. You are required to sign a medical statement and waiver in your registration packet before any training is delivered.

FITNESS

It's a physical 4 days coming up! (Plus assessment/Evaluation)

You need to have a level of fitness to do this thing called Rope Access. Why?

1. You'll find it easier and,
2. You'll be less likely to sustain an injury.

You will be using muscles you don't normally use and because you're new to this, your climbing technique is going to be sloppy! Good core and leg strength will benefit you greatly. However, we will show you some tips and tricks and as the week progresses and your technique gets better it will become easier. Having said that, some people take to it like a duck to water. Others not so much! But don't worry if the guy next to you is flying up and down the ropes, *safety* is paramount in this industry, *not speed*. We WILL get you there!

Refresher Training and Expiry

When/why would I need refresher training?

Once certified, your ticket is valid for 3 years, no matter what. However, if you do not work on ropes for a consecutive 6 months, it is recommended that you undertake refresher training. As a student of our program, you are eligible for life for our OPEN GYM nights, where you can come and refresh your skills and get your logbook signed to keep current. Contact the office to register!

> If rope access Technicians do not use rope access methods for a period of more than six months, they are required to undergo refresher training. The training should be appropriate for each individual and should be recorded in his or her logbook, see ICOP Part 2, 2.5.2.8. Refresher training:
> a) shall be carried out by an IRATA International Level 3 rope access Technician;
> b) shall not be carried out during operational duties;
> c) may involve the need to undergo a full training course.

IRATA TACS 4.11.2

IF YOU ARE RE-CERTIFYING YOUR L1

Already got your level 1 certification? Both IRATA and SPRAT certifications last 3 years, you must therefore seek to revalidate at level 1 again or gain progression to level 2 within this time.

Both associations allow recertification 6 months prior to the original expiry date. Your new certificate would then start from the new date, so in theory, your revalidation could last up to 3 years, 6 months!

If you're an expired technician, this normally is not a problem as long as you're just seeking level 1 status again.

Expired L1 IRATA technicians are NOT eligible for upgrading to level 2. You must first regain your L1.

Expired L1 SPRAT technicians are eligible for upgrading to level 2 as long as your 500 required working hours were obtained while your L1 was still valid.

Hopefully you've remembered to bring your logbook with you this morning!

We have two blog posts on logbooks! What to do when you lose them and how to fill them out properly. Check it out @ http://pacificropes.com/blog/

So, how does it all work?
Upon completion of at least 30 hours of training over the next 4 days, you will then be independently assessed by an IRATA Assessor and/or evaluated by a SPRAT Evaluator on the 5th or 6th day; depending on which qualification you seek.

When you pass your assessment/evaluation, you will receive in the mail, an A4 size certificate to put on your mom's fridge at home, an ID card to show everyone in the bar after a few beers, and a logbook that you WILL cherish forever!

Your logbook is very important! It will act as your resume for all the Rope Access work that you will be involved in throughout your new and exciting career.

When your logbook arrives:

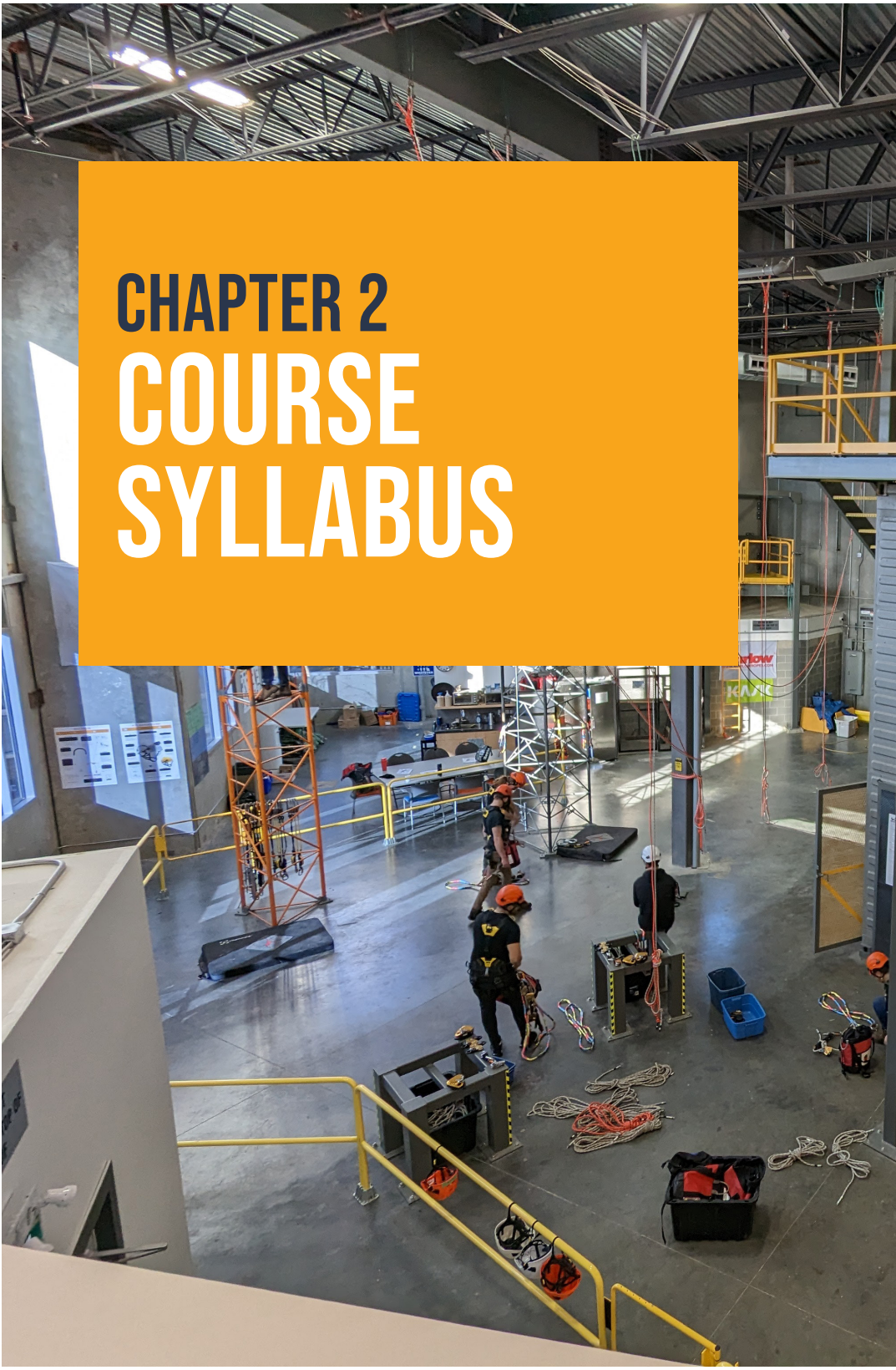
- Open it and make sure the photo on the first page is in fact you!
- If it is, then sign your new logbook where it says 'signature'; if it's not, contact IRATA/SPRAT.
- Read the inside of the front and back cover pages, this will explain how to use the logbook.
- Fill out your contact information, even if it's just an email address.
- Each time you fill a page in the logbook, take a photo or a scan of it as a back up in case you lose it. It's very difficult to replace lost hours!!

WE CAN'T STRESS ENOUGH HOW IMPORTANT IT IS TO LOG YOUR HOURS OF EXPERIENCE LEGITIMATELY, AND KEEP UP TO DATE WITH IT. If you have questions on how to fill out your logbook accurately refer to the first pages of your logbook for guidance, and the IRATA TACS (4.13), and SPRAT Certification Requirements for further detailed guidance.

It is a requirment from WorkSafe BC and Alberta OHS to keep your logbook up to date, and must be accessible while working on site. Failure to do this could result in a significant fine from your provincial legislative body.

For further reading on logbooks, you can refer to some other manuals that you will receive on this course:

- IRATA Training, Assessment and Certification Scheme (TACS 4.13)
- SPRAT Certification Requirements 4.1



CHAPTER 2
COURSE SYLLABUS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Training

We have lots to do over the next 4 days. The level 1 syllabus is an intense program, especially if you have little or no working at height experience. The first two days are a steep learning curve in terms of remembering the names of all the equipment, how to use it correctly and safely, understanding equipment limitations, and where/when to attach the equipment to your ropes!

Usually on the 3rd and 4th days, things will become clearer as you begin to understand the concept of Rope Access and what's involved. Operating and managing your personal equipment will almost become second nature due to the large amount of practical exercises we will be learning.

Our classroom-based sessions will involve local legislations, familiarization of IRATA and SPRAT documentations, group discussions on equipment maintenance and inspections, and some hilarious, *ahem*, 'educational' videos!

The level 1 course really is all about the practicality of Rope Access. We are probably looking at about 90% practical to 10% theory.

Assessment/Evaluation

The big day has arrived!!

Your assessment/evaluation will involve a theory test that will consist of 20 multiple choice questions followed by an oral equipment discussion and then your practical exercise demonstrations.

Examinations are a nervous affair for us all, regardless of what's at stake. 'Fail' is a word we don't like to use, let alone put in our training manual. However, it is a reality and something you need to be aware of as a potential outcome of your assessment/evaluation.

Level 1 pass percentages here at Pacific Ropes are noramally very high. That said, if you do fail it is not the end of the world nor your Rope Access journey. Sometimes an extra day or two of training is required or you may have just had a bad day at the office. We're all human, after all!!

What happens if I don't pass?

You get straight back up on that horse!!

We can get you booked in for a re-assessment/evaluation. The sooner the better while the training is still fresh in your head. We can discuss if you need 1,2,3 or 4 days of further training. Normally, an extra day of training then a second crack of the whip is enough to see you over the line!

What merit's a non-pass?

It's a bit like baseball – 3 strikes and you're out!

During the assessment you can pick up minor or major discrepancies. Three minor discrepancies equates to a non-pass, as does one major.

We will discuss as a group what the differences are between minor/major discrepancies and how they are issued.

The discrepancies listed here are IRATA TACS examples.

EXAMPLES OF MINOR DISCREPANCIES

- Descending device not locked off or no control of the tail rope;
- Attachment connectors not secured;
- Critical personal fall protection equipment dropped;
- Rope protection incorrectly placed;
- No braking carabiner used when required;
- Harness incorrectly adjusted;
- Helmet chinstrap unfastened;
- Critical personal fall protection equipment missing from the harness set-up;
- Tangles of ropes;
- Poor management of back-up device (major if critical);
- Work positioning lanyards such as cow's tails positioned greater than fall factor 1;
- Excessive slack in connection to an ascending device used as a point of attachment (major if critical);
- Considerable time taken to perform the task;
- Unconventional or untrained techniques used;
- A small out-of-control swing.

EXAMPLES OF MAJOR DISCREPANCIES

- Only one point of safety attachment while in suspension;
- Unable to complete the task; or excessive time
- No back-up to protect against a potential out-of-control swing that may cause injury or damage in the event of failure of an item of equipment;
- Harness unsecured;
- Anchor lanyards and device lanyards, e.g. cow's tails, tied or attached dangerously;
- No helmet at height;
- Critical harness connectors unfastened or unsecured, e.g. screw links (maillon rapides);
- Misuse causing damage to equipment;
- Unsuitable choice of rope protection measures;
- Uncontrolled descent during rescue;
- Descending device threaded incorrectly and used in that manner;
- Back-up or other devices used upside down;
- No safety attachment close to an exposed edge;
- Excessive slack in connection to an ascending device used as a point of attachment;
- Critical safety issues as defined by the assessor;
- A swing that could cause injury.

What about SPRAT?

SPRAT Evaluators have a comprehensive list of almost anything you could do, right or wrong, on evaluation day. This goes all the way from "Lying" and "Fraud" (which both constitute a fail) to having your helmet chinstrap unfastened inside the exclusion zone, which constitutes a "pass".

In the new Certification Requirments however, SPRAT has given us a non-exhaustive list similar to what IRATA documents give us.

What merit's a "Fail"?

The same rules apply in SPRAT as in IRATA. You are allowed two Discrepancies, the third one will constitute a Fail. And a major safety infraction with consititute as an immediately "Fail".

Here is the non-exhaustive list given to us by SPRAT Certification Requirments section 2.3:

EXAMPLES OF DISCREPANCIES

- Unlocked carabiner in safety system.
- Helmet unfastened.
- Task not completed in a timely manner.
- Not providing additional friction to descent control devices as required by the manufacturers specifications in certain circumstances. (eg. Rescue pick-offs with two person loads)
- Dropped equipment.

EXAMPLES OF A "FAIL"

- Relying on one rope system when that system if your primary means of support.
- Ineffectively used back-up device (eg. excessive slack above backup device; upside down backup device)
- Not capable of performing one or more of the tasks required.
- Unacceptably slow at completing one or more of the tasks required.
- Uncontrolled or dangerous descent or swing.
- Descender threaded incorrectly and used in that manner.
- No fall protection used when within 6 feet (1.8 meters) of an unprotected edge.
- Use of inappropriate equipment as a backup device. (eg. toothed ascender that may damage rope when dynamically loaded)
- Unprofessional conduct.
- No helment while working at height.

Course Syllabus

Time for the 'nitty gritty', here's what we need to learn over the next 4 days! As stated earlier, there are some subtle differences between level 1 IRATA/ SPRAT courses and we will explain this in more detail through the week.

PRACTICAL STUFF

The BASICS

- Setting up your harness and safety equipment correctly.
- Carrying out a full 'buddy' check with a colleague.
- How to inspect and operate your safety equipment.
- Management of your back-up devices.
- Ascending a twin rope system.
- Performing a change of direction (changeover).
- Descending a twin rope system.
- Ascending using a descending device.
- Descending using an ascending device.

The MANEUVERS

- Rope to rope transfer (> 1.5m apart in distance).
- Ascend and Descend through a Re-Anchored rope system (< 1.5m apart).
- Ascend and Descend through a Re-Anchored rope system (> 2m apart). SPRAT only.
- Ascend and Descend through a Deviated rope system (single + double).
- Ascend and Descend past knots in a rope system.
- Ascend and Descend over an edge, rope system rigged at 90 degrees.
- Ascend and Descend past mid-rope protection.

The CLIMBING

- Horizontal Aid climbing using fixed anchor points.
- Horizontal Aid climbing using mobile anchors (slings or strops).
- Climbing using Fall Arrest equipment (shock absorbing lanyards).

The RESCUE

- Rescue of co-worker suspended in Descend equipment (separate ropes). IRATA/SPRAT.
- Rescue of co-worker suspended in Ascending equipment (separate ropes). SPRAT only. This is a "rescue scenario" in which the rescuer will change-over the stranded worker into their descenders and then continue with a standard descent rescue.
- Lowering of co-worker using a pre-rigged to rescue system.

The RIGGING

- Knots and rope handling.
- Anchor selection.
- Basic anchor system.
- Load sharing anchor system.
- Installation of rope protection.
- Simple mechanical advantage system.

THAT'S A LOT OF HUFFIN' N' PUFFIN' RIGHT NOW.....

THEORY STUFF

Having a good understanding of the required theory is obviously a very important aspect within our industry. You will need to demonstrate in open discussion and in a written test that you have a basic awareness of several documents and legislation.

The DOCUMENT

- IRATA International Code of Practice – ICOP
- IRATA Training and Certification Scheme – TACS
- SPRAT Safe Practices for Rope Access Work
- SPRAT Certification Requirements for Rope Access Work
- SPRAT Evaluation Guidelines
- This AWESOME Pacific Ropes Training Manual!

The LEGISLATION

- Occupational Health Standards – OHS (Ontario)
- WorkSafe BC – part 11 and part 34
- Alberta OHS – part 41

Course Syllabus

The STANDARDS

- Canadian Standards Agency – CSA
- American National Standards Institute – ANSI
- The European Committee for Standardization – EN

Just look at the classroom based stuff as an opportunity to rest those aching limbs!!

Make use of the 'STUDENT RESOURCES' page on our website, it is FULL of good resources and videos to keep your skills fresh even after you've left us! Check your registration email to find the link!

Other useful websites:

- IRATA-www.irata.org
- SPRAT-www.sprat.org
- OHS-www.worksafebc.com
- Petzl-www.petzl.com

Things To Keep In Mind

ALWAYS

Use equipment for its intended purpose and as per your training

ALWAYS

Know what method of working at height you are using!

ALWAYS

Keep yourself and others safe

ALWAYS

Minimize the consequences of one component failing

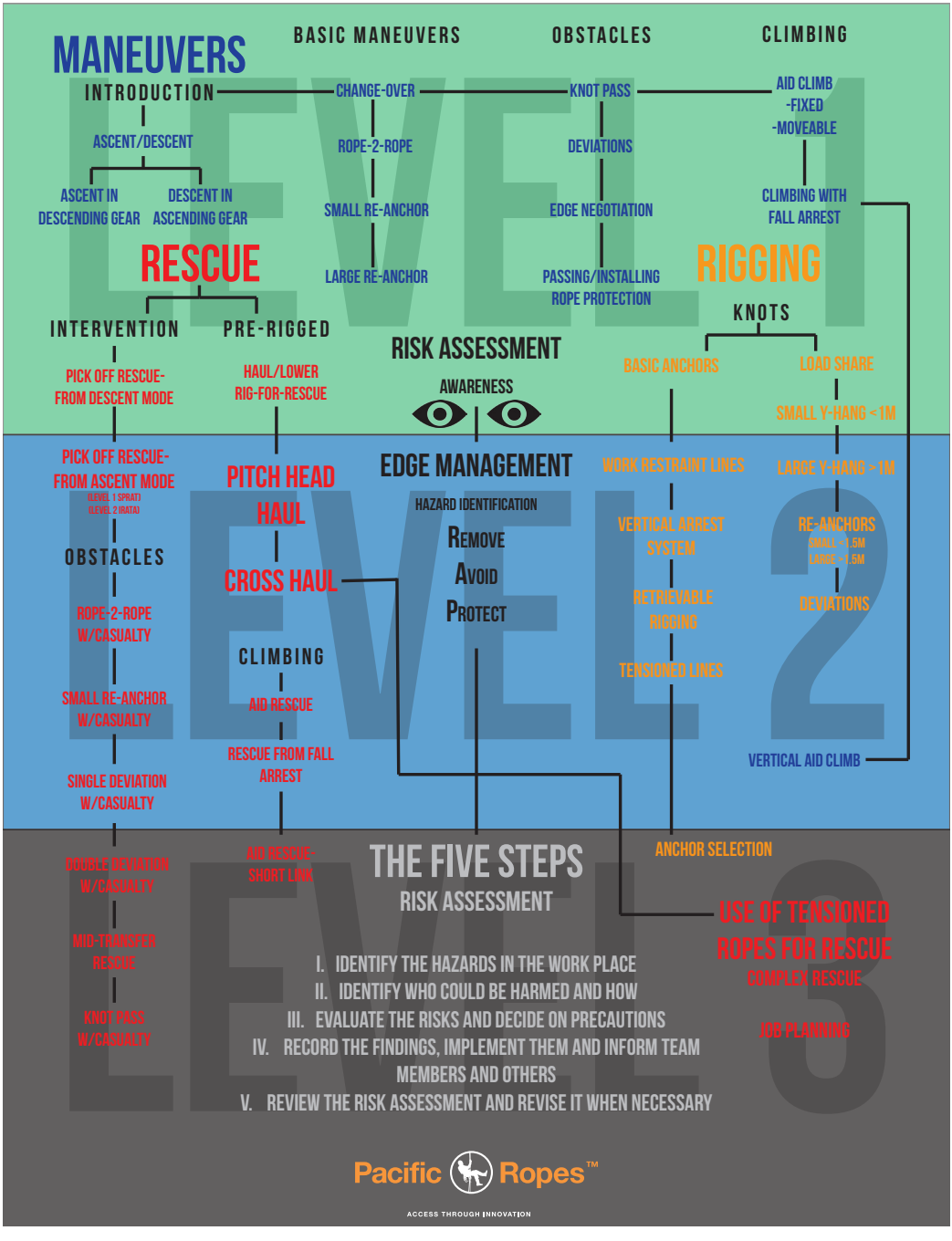
ALWAYS

RISK ASSESS everything!!

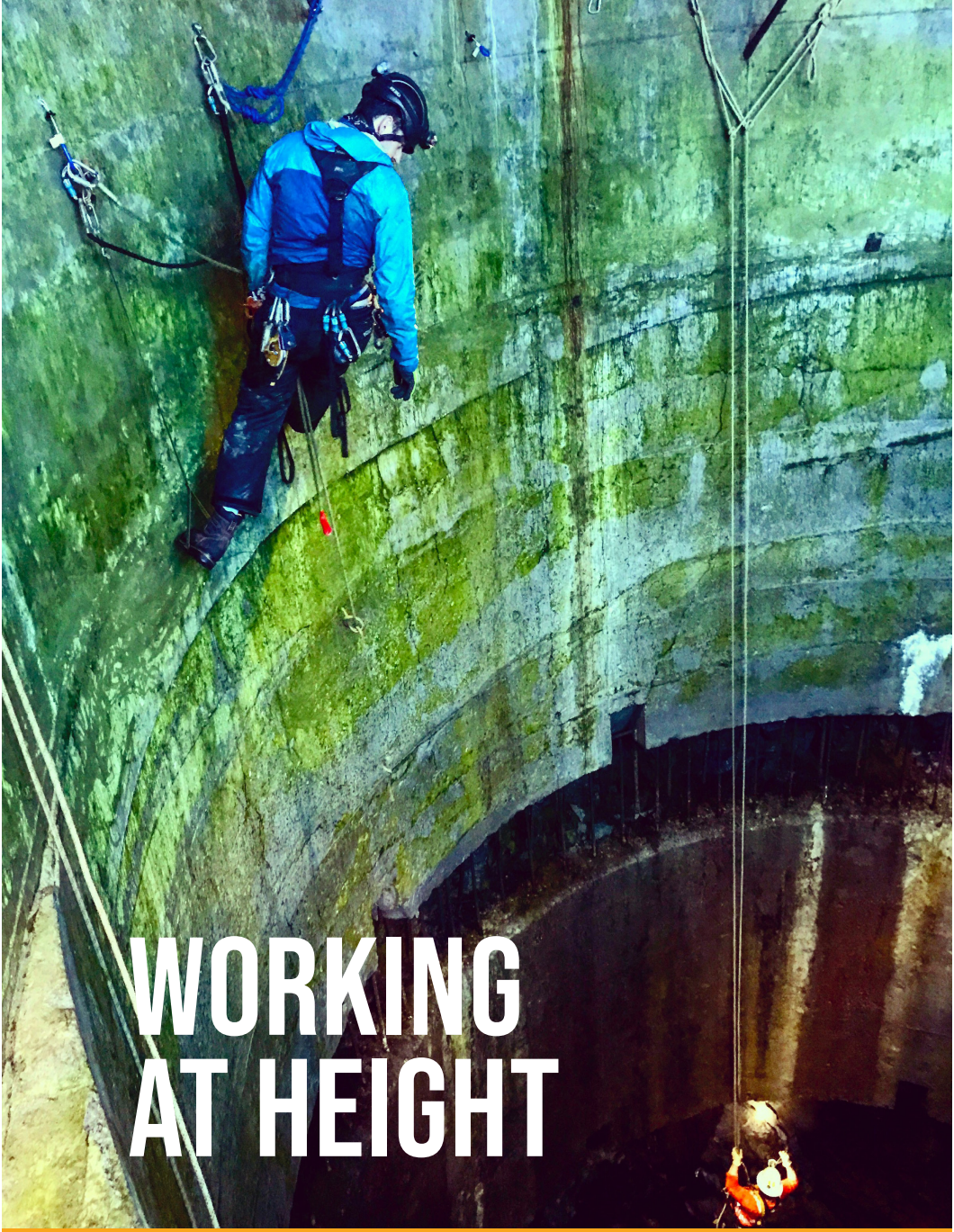
All work at height should have a goal of no accidents, incidents or dangerous occurrences. It is essential, therefore, that the entire work project is operated as a "safe system of work".

IRATA ICOP 2.1.1

Rope Access Skills Flowchart



Personal Notes/Things to remember:



WORKING AT HEIGHT

CHAPTER 3

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Photo Credit: Joshua Delefortrie
Hydro Site, Squamish, BC

How do we achieve a "safe system of work"?

The ESSENTIAL elements of a safe system of work include:

- Proper planning and management
- The use of trained, competent persons
- Good supervision
- The careful selection of appropriate equipment
- Proper care, maintenance and inspection of equipment
- Proper control of working methods, including;

    1. Provision for emergencies;
    2. The protection of third parties;
    3. The use of work equipment;
    4. Exclusion zones

Planning and Management

"The primary objective behind the planning and management of Rope Access projects is to create a work environment that maximizes safety and minimizes the risk of error, possible incidents and injury, i.e. to provide a safe system of work."

IRATA ICOP 2.2.1

A safe system of work, I think we've mentioned that already? Must be IMPORTANT!! An essential component to Planning and Management is carrying out a Job Hazard Analysis or Risk Assessment.

WHAT IS A RISK ASSESSMENT?

A risk assessment is simply a careful examination of what, in your work, could cause harm to people. Doing a risk assessment allows you to weigh up whether or not you have taken enough safety precautions or if you need to implement more in order to prevent harm. Workers and others have a right to be protected from harm caused by a failure to take reasonable control measures.

We all started doing this when we were kids, "Look both ways before crossing the street!" That's the first exposure to 'risk assessment' we have, and it should be relatively easy to expand our awareness of that into more hazardous environments.

Keep your eyes open; always know where your hazards are coming from.

HOW TO ASSESS THE RISKS IN YOUR WORKPLACE:

STEP 1 Identify the hazards in the work place (Hazard is something that has the potential to cause harm)

STEP 2 Identify who could be harmed, and how.

STEP 3 Evaluate the risks (Risk is the likelihood of coming into contact with the hazards listed in Step 1) and decide on precautions

STEP 4 Record your findings, list your controls for minimizing or removing the hazard, and implement them

STEP 5 Review your assessment and update if there is a change in work scope or location, or new hazards present themselves.

HOW DO I WRITE A METHOD STATEMENT?

The first task is to carry out a risk assessment (done!). A risk assessment will highlight the significant hazards and control measures required to prevent injury or ill health while carrying out the task; and will provide details to add to your method statement document.

Section 1

The first section of your method statement document is the header information and should be used to provide information to your staff or prospective clients, this section might include:

- A Title e.g. Work Method Statement, or Standard Operating Procedure
- A brief description of the work, task or process
- Your company details, logo, name, address
- Start date, completion date
- Site address
- Site contact details including emergency numbers
- Document author, H&S contact
- Document number, issue date, revision date, revision number

Section 2

The second section can be used as a summary of the main hazards that are present and the control measures that must be implemented. This section should also be used to list the Personal Protective Equipment that must be worn. The information for this page will be extracted from your risk assessment document. Section 2 can also be used to detail any Environmental or Quality procedures that must be taken during the task.

Section 3

The third section is used to describe the task in more detail and relevant generic information such as:

- Staff, Training, and PPE
- Permits to work
- Rescue Plan
- Machinery shutdown and lock off procedures
- Site Access and Egress
- Material Handling
- Scaffold & Access to height
- Background and preparation
- Welfare and first aid

Section 4

The fourth section is the step by step guide. Use this section to explain in detail the steps that must be taken to ensure the task is carried out safely, include all relevant details in the order that you expect them to be carried out.

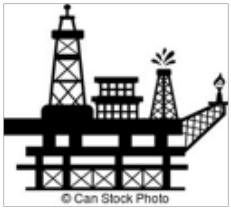
WORK TEAMS

Under IRATA a Rope Access team must consist of at least two Rope Access technicians. However, depending on many situations e.g. site conditions, competency of the work team, or potential rescue scenarios, this number may be more than two. At least one member of the working team must be an IRATA level 3 and be competent to supervise Rope Access safety.

Under SPRAT a Rope Access team should consist of at least two Rope Access technicians. One member of the work team should be qualified as a Rope Access supervisor (L3) or lead technician (L2). The Rope Access supervisor (L3) should ensure that the provisions for rescue are adequate. Sufficient personnel should be readily available to provide assistance in the event of an emergency.

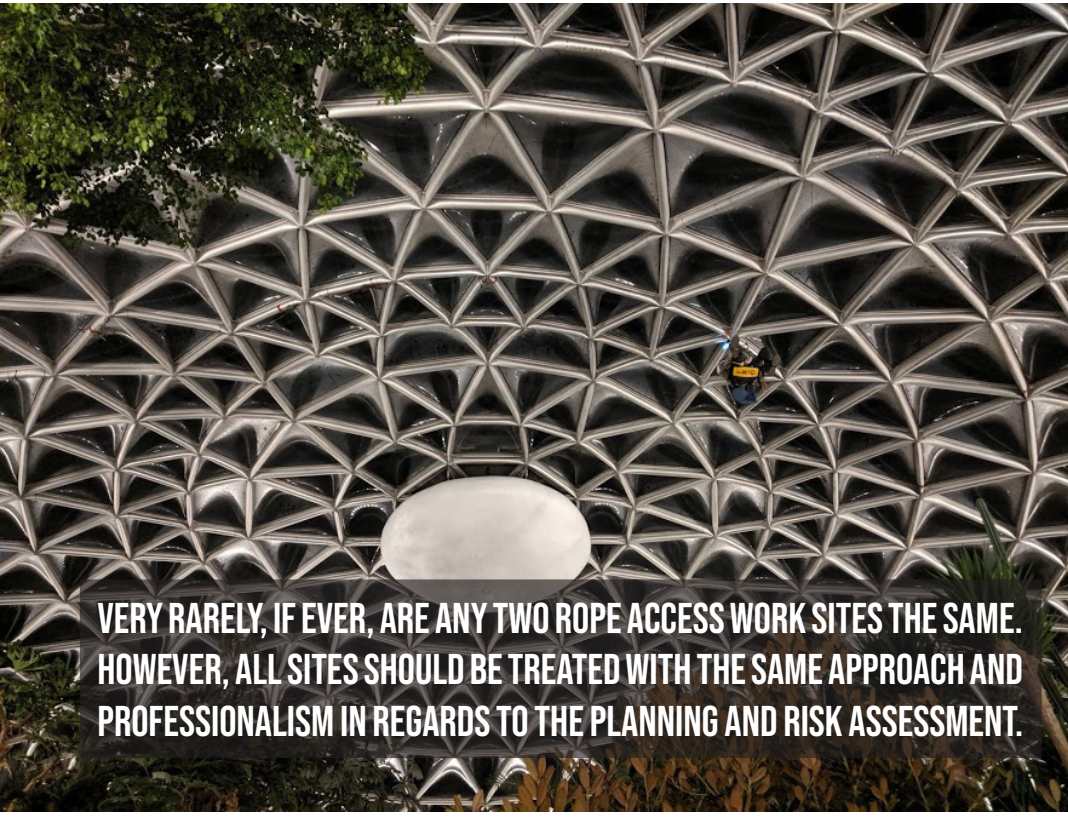
Zones

What does a rope access site look like?
Take your pick:



What do we need to create before any work takes place? Do you Remember? Name two documents.

Answer:



The last element of the safe system of work process is 'Proper control of working methods' including:

- Provision for emergencies;
- The protection of third parties;
- The use of work equipment;
- Exclusion zones.

Exclusion zones may need to be set up to protect people from falling or to protect people against falling objects. They may be also be required for reasons other than fall protection, e.g. to protect against exposure to radiation; radio waves; high temperatures or chemicals. The main purpose of the exclusion zone is to ensure there is no risk to other people. However, they are also clear demarcations of hazardous areas for workers as well.

In some situations we sometimes need to protect ourselves from vandals tampering with suspension equipment or rigging by using an additional team member to monitor the exclusion zone. To be clear, an exclusion zone alone will not keep theives or tamperers away from your equipment, you must think of implementing a exclusion zone monitor.

ANCHOR AREA EXCLUSION ZONE

We have to protect our rigging! The anchor area exclusion zone should be large enough to include all anchor points and to provide safe access to the working edge. Only members of the Rope Access team should be allowed in the this area, unless under close supervision. A permanent member of the team may be required to oversee this zone at all times.

PROTECTION OF THIRD PARTIES

We have to protect the public! The most obvious example of this is the potential of dropping tools or equipment. All tools must be secured to either the technician or on a separate line. Normally, items weighing over 8 kilograms should have their own line for attachment; anything below this may be secured to the worker.

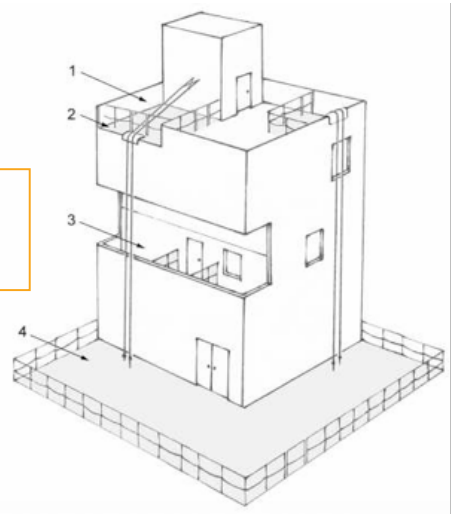
Temporary roofing or netting may also be an option to protect against falling equipment or materials.

When establishing protection zones for falling debris, where reasonably practicable, the width of the zone should be equal to the height of the work position.

WORKING EDGE HAZARD ZONE

We have to protect ourselves from falling! The working edge hazard zone can be defined as any location within the anchor area exclusion zone where a risk of falling from height exists. No one should be allowed to enter this area for any purpose, unless they are wearing a harness and helmet and are attached to an anchored safety line.

1. Anchor are exclusion zone
2. Working edge hazard zone
3. Exclusion zone at intermediate
4. Exclusion zone at bottom level



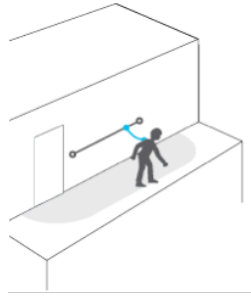
Work Positioning | Work Restraint | Fall Arrest

WORK POSITIONING

A work positioning system supports the user and allows the technicians to position themselves precisely, supported or suspended. This system is not designed to arrest a fall; the user must be under tension on his positioning system. The work positioning system must be completed with a fall arrest system.

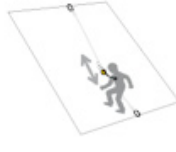
WORK RESTRAINT

A restraint system limits the work zone, keeping the worker from entering an area that may present a risk of falling. This system is not designed to arrest a fall from height.



FALL ARREST

The fall arrest system is a belay system that is independent of the progression or work positioning system and is connected to the A (fall arrest) attachment point of the harness.
The fall arrest system doesn't prevent a free fall. Its role is to arrest it while limiting the impact force experienced by the user. It must therefore be used with enough clearance to allow for a free fall.



Fall Factors

"Fall factors are used to measure the severity of a fall when using ropes or lanyards and are defined as the length of a potential fall divided by the length of rope or lanyard available to arrest it."

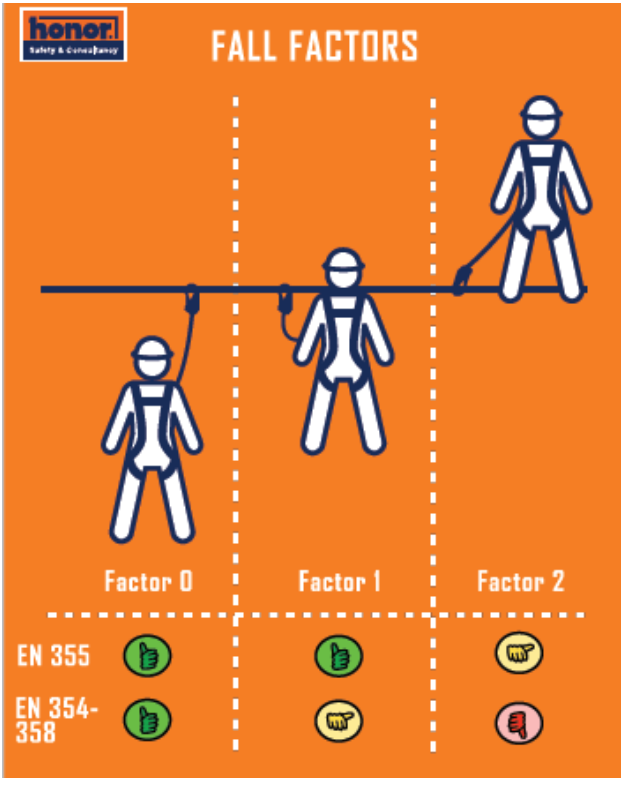
IRATA ICOP Q1.1

The dynamic rope lanyards that you will use here at the training school and out in the field *actually* have a LOW capacity when it comes to absorbing energy! Yes, that's right, I said low!

"But I thought they're made from dynamic rope; which is super stretchy?!?"

Also correct! HOWEVER, given the short length of the lanyards (typically 60cm – 80cm) this doesn't really allow for much elongation to take place in the event of a fall.

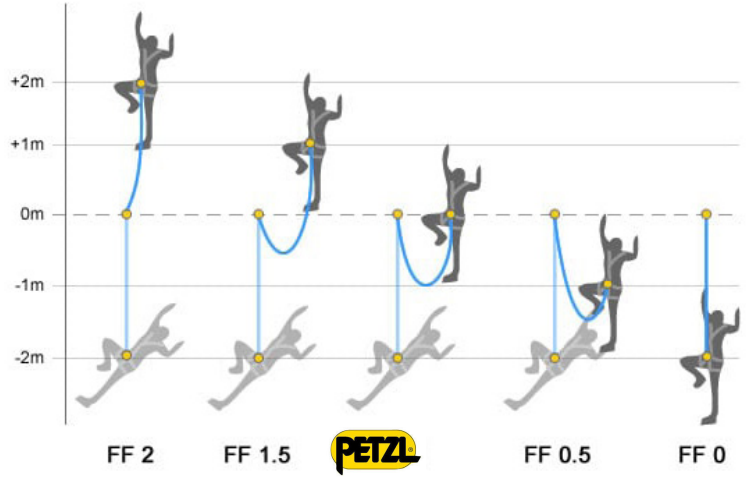
Therefore, we need to take more care in our placement of our lanyards and always try to work below our anchor points when attached to them.



When we fall, we are going to create a force impact when we come to a stop! We usually measure this force using Kilo newtons (kN). The acceptable limit to which we are allowed to have varies depending on where in the world you are working. It will range anywhere from 4kN – 8kN.

The fall factor is the ratio of fall distance to rope length

Here we have three (with half way marks considered) typical examples of some basic fall factors (FF).



Example 1: FF 2 – If the user were to fall from this situation, they would fall twice the full length of their lanyard, which will increase the severity of the fall to an impact force of greater than 6 kN (Kilo newtons). This situation should be avoided at all times when working in suspension.

Example 2: FF 1 – If the user were to fall from this situation, they would fall the full length of their lanyard, which may or may not increase the severity of the fall to an impact force of greater than 6 kN (Kilo newtons). This would, of course depend on varying factors!

Example 3: FF 0.5 – If the user were to fall from this situation, they would fall half the length of their lanyard which would keep the severity of the fall below an impact force of less than 6 kN (Kilo newtons).

If we were to be working in this situation, we'd be working under Fall Arrest and we would incorporate on to the lanyard an energy absorber. The complete length of this lanyard system must NOT exceed 180cm in North America and the user must not be allowed to exceed >8kN of an impact force.

By incorporating an energy absorber, we are maintaining the potential impact force to <6kN even from a fall factor of 2.

Fc < 6 kN

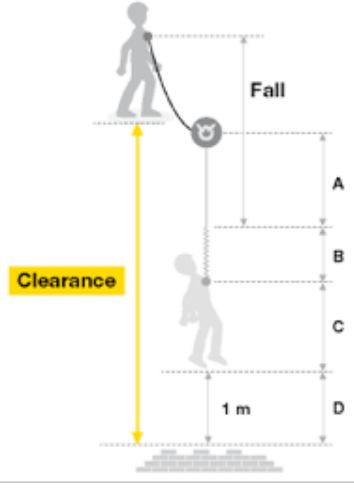
FF = Distance of Fall / Length of Lanyard

"Fall Factor gives us the 'relative severity of the fall' in a non-specific representation."

THE MAXIMUM ALLOWABLE POTENTIAL FALL WHEN USING DYNAMIC ROPE 'COWSTAILS' IS 0.5M DISTANCE - FF1

CLEARANCE DISTANCE

Clearance is the amount of clear space required below the user to avoid hitting an obstacle in a fall.



A: Lanyard Length

B: Tearing of Energy Absorber

C: Average distance between harness attachment point and the worker's feet 1.5m

D: Safety margin required by the standard 1 m

E: The potential elongation of the support (rope stretch)

Physics and Units

Kilo-Gram (kg) Unit of Mass

- Gram (g) is a metric unit of Mass. One kilogram is 1000 grams. *(kilo is greek for thousand.)*
- 100kg Converts to 220lbs mass in the Imperial System.
- Mass and Weight are not the same thing.

Kilo-Newton (kN) Unit of Force

- Newton (N) in a metric unit of Force. One kiloNewton (kN) is 1000 Newtons
- Under static loading, 1kN equates to the force applied by 100kg mass times Earths gravity onto the ground. Converting 1kN to 100kg is useful and common but not totally accurate, in dynamic situations 100kg may exert alot more force than just 1kN

Mass (M)

- Mass is a direct measurement of quantity of matter, regardless of acceleration, velocity and direction. It is expressed in kg (Metric) and lbs (Imperial)

Weight

- Weight is a unit of Force. As such it varies according to gravity and acceleration. It is expessed in kilonewtons.
- For example: a 100kg human standing perfectly still on the Earths surface weighs in at .98kN, on the Moon, .16kN and on the Sun, 270kN.
- Because we are always on Earth, and mostly not free falling, Weight often gets confused with Mass.

Force (F)

- Force is a unit of measurement of push or pull on an object. It is a vector quantity, and requires magnitude and direction, usually displayed by an arrow. It is measured in Newtons (N) and calculated from Mass x Acceleration.

Acceleration (A)

- Acceleration is the rate of change of velocity of an object. In Rope Access, the acceleration used to calculate forces is Gravity (9.8 m/s^2) commonly approximated to 10 m/s^2

CHAPTER 4
PERSONAL PROTECTIVE EQUIPMENT

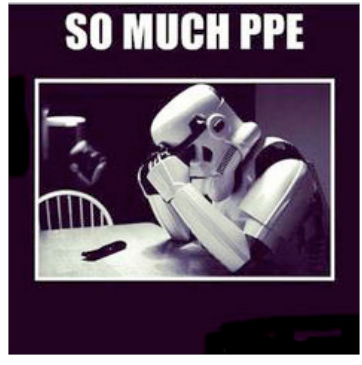
Photo Credit: Josh Delefortrie
Bloedel Conservatory, BC

Personal Protection Equipment-PPE

OHS Regulations part 8; Personal Protective Clothing and Equipment, places a responsibility on both the worker and the employer to provide:

A worker is responsible for providing:

- Clothing needed for protection against the natural elements
- General purpose work gloves and appropriate footwear including safety footwear
- Safety headgear



An employer is responsible for providing, at no cost to the worker:

- All other items of personal protective equipment required by the Regulation

When selecting PPE it is imperative that the equipment is used in accordance with the recognized standards and manufacturers instructions. It must provide effective protection for the task at hand and must not in itself create a hazard to the wearer.

PPE inspection and maintenance is a vitally important link in the chain when working at height, either of which should only be carried out by a 'competent person' with the relevant experience and knowledge specific to the equipment.

The manufacturer shall always provide information on the inspection, care and maintenance of equipment and this should be strictly adhered to. Any modifications to PPE should only be done after seeking the manufacturers advice and approval.

The Careful Selection of Appropriate Equipment

They are many different equipment manufacturers out there today, meaning that we have a multitude of different options available to us when it comes to working at height.

Here at Pacific Ropes, we pride ourselves on providing, what we feel is the most suitable equipment on the market today. This has been a collective decision by the many multi disciplined and highly experienced technicians that work here both in training and in operational circumstances.






However, if when you leave here to start your working at height careers and you're supplied with different equipment than what you have been trained on during this course, it is your employers responsibility to ensure that you are familiar and competent in the use of what they supply you! Whatever your gear looks like though, it's imperitive to keeping you safe!!

Follow Pacific Ropes on social medias and as we run open gym nights when you can come down and 'hang' out, try new and different types equipment, and get some logbook hours – FOR FREE!!!

Maintenance and Inspection of Equipment

The manufacturer shall always provide information on the inspection, care and maintenance of equipment and this should be strictly adhered to.
Any modifications to PPE should only be done after seeking the manufacturers advice and approval.

There are several types of inspection, including the thorough examination that an item of equipment will be subject to over its' lifetime. These are:

THE ACCEPTANCE CHECK

When an item of equipment is received from the supplier, it must be checked over by a competent person to ensure it is free from defects and it is fit for use. Here we can begin logging our inspection records with the date the piece of gear was 'put into service'.

THE PRE-USE INSPECTION

These are inspections carried out by you, the user, prior to the commencement of any work, after any breaks or periods away from your equipment, and at the start of every shift. You will also be shown how to perform a 'buddy check' that is done in pairs or as a team.

THE DETAILED OR THOROUGH INSPECTION

Carried by a competent person at intervals NOT exceeding 6 months. This should be done in accordance with the manufacturers guidance and the results WILL be recorded.

THE INTERIM INSPECTION

Where equipment is used in arduous conditions or exceptional events, which compromises the safety of the equipment. Examples include:

- In a rescue situation
- A humid environment
- Lifting unusual loads

These checks need to be done by a competent person at intervals determined by a risk assessment. Also requires a record.

USERS OF PPE CARRYING OUT A PRE-USE CHECK SHOULD POINT OUT ANY AREAS OF CONCERN OR WEAR AND TEAR TO THEIR SUPERVISOR.

We are already half way through this manual and have hardly thrown any acronyms at you guys! So, here are just a few for you to get your heads around!

MBS — Minimum Breaking Strength

WLL — Working Load Limit

SWL — Safe Working Load

Great! So why do we need these and what do they mean to us? Well, let's first take a look at the back of a Petzl I'D. So many numbers!

Why no SWL then? Well, you have to calculate it! PPE will in most cases give us an MBS and/or a WLL. For example, the Petzl I'D gives us both so that we know it's limitations. However, a carabiner or a rope for example, won't give us a WLL. But, it will definitely give us an MBS. So, for us to work out a SWL, we use a factor of safety of 10:1. The MBS will be either marked on the equipment itself or supplied on the manufacturers certificate of conformity.

Once we find out the MBS we divide it by 10. See the examples shown for a carabiner and one for a rope!

SWL = MBS: 27kN/2700kg ÷ Safety Factor: 10 = 270kg

SWL = MBS: 32kN/3200kg ÷ Safety Factor: 10 = 320kg - 35% If terminated with a figure 8 knot = 210kg

HARNESSES-ASTRO® BOD FAST International Version

With an integrated CROLL L ventral rope clamp, the ASTRO BOD FAST harness is designed for greater efficiency and comfort during rope ascents. The gated ventral attachment point allows optimal integration of equipment (such as rope clamp, or seat). The wide, semi-rigid waistbelt and leg loops provide excellent support. The DOUBLEBACK self-locking buckles at the rear of the harness, between the waistbelt and the leg loops, allow for a shorter adjustment when the dorsal attachment point is used.

PETZL

WorkSafeBC also states, a full body harness that meets CSA standard Z259.10 is acceptable.

If there is a red indicator showing on the dorsal attachment point, the harness MUST be retired. This will happen after a shock loading of greater than 400 daN has occurred.

Certifications:

- ANSI Z359.11
- EN361
- CSA Z259.10
- CE EN 361
- CE EN 358
- CE EN 813
- CE EN 12841 type B

List the primary functions and features

The harness is a worker's link to his safety system. With some exceptions, harnesses suitable for industrial rope access must be a full-body design (or integrated chest and seat harness). Features:

- Structural D ring connection points (redundant by design)
  - Waist - positioning (ventral) and some back up devices, work restraint
  - Sternal - back up device and limited fall arrest
  - Lateral - work positioning in pairs only
  - Dorsal - fall arrest
- Rear waist loop - work restraint (Only good for 800lbs)
- Pre-double backed buckles and straps with stitched-over terminations
- Contrast color stitching for visual inspection (critical stitching)
- Impact indicator below dorsal D ring (turns red @ 2-3kn)
- Gear loops and tool bag attachment points rated for 10kg each

List the proper handling and use

- Fit and test new harness for comfort with suspension test (Reference Harness comfort and adjustability test - ICOP annex D)
- Adjust properly and tighten shoulder straps before use
- Check screw link connection before each use (for security – do not unscrew) – required torque loading of 3Nm (for 8mm diameter). Forms a semi-permanent point
- Use D rings for intended use (i.e. Sternal for fall arrest device or SRL. Dorsal for North America with Y-lanyards)
- Do not expose to heat, chemicals, sharp edges, abrasion and extended UV exposure
- Do not use lateral D rings as single point positioning (use them only in pairs)
- Do not attach heavy loads or tools directly to harness gear loops (maximum loading of 10kgs)

Do's:

- Put harness on correctly
- Perform buddy check
- Dorsal D between shoulder blades for fall arrest

Don'ts

- Expose to chemicals
- Expose to heat

Inspection for function

- Check buckles and fasteners, ensure the fasteners close and the webbing doesn't slip through buckles.
- Screw link closure, should be tightened with a wrench to 3Nm.

Sit in harness to ensure proper fit and comfort, with feet planted on the ground.

Inspection for wear

- Inspect webbing and stitching for:
  - Abrasion and cuts, frays
  - Discoloration and hard spots indicating chemical or heat etc. damage
- Impact indicator below dorsal D (exposed red tag)
- D rings for corrosion, material loss and deformation
- Confirm specifications and tracking information are present.

HELMETS- PETZL VERTEX-CANADIAN VERSION

"Helmet for work at height and rescue
With its strong chinstrap, the VERTEX BEST helmet sets the standard in head protection for workers at height. Its unventilated shell protects against electrical hazards and molten metal splash. Its six-point textile suspension ensures maximum comfort, and its CenterFit adjustment system adjusts the headband and keeps the helmet centered on the head. The VERTEX BEST is designed for optimal attachment of a headlamp, protective shield and hearing protection".

PETZL

The OHS Regulation Guidelines, Part 8, tells us that safety headgear must be worn by a worker in any area where there is a danger of head injury from falling, flying, thrown objects or other harmful contacts. Safety headgear must meet the requirements of:

- CSA Z94.1-05
  Type 1 Class E
- ANSI Z89.1- 2009
  Type 1 Class E

The helmets you will be using today also meet the requirements of the EN 397 and EN 12492 standards for impact protection.

List the primary functions and features

Head protection from top impact (type 1) [CSA/ANSI] Protection from top and side impact (type 2) [EN] -10 year maximum life span

- Specified sticker locations, gloss areas on front, back and sides of helmet
- Class E- Rated for electrical work
- Class C- version available with vents (Limited electrical rating)
- Attachments for head torch, visor/face shield and hearing protection
- Internal Headband is replaceable
- Breakaway strength of Chinstrap is 50 kg's – to keep it in place in case of a fall (The new version has a dial that allows the user to change from 25kg (for groundwork) to 50kg (work at height)
- Operating temperature range minus 40c to plus 50c (brittle when cold, easily melted)

List the proper handling and use

- Fit and adjust properly
- Keep chin strap buckled and snug
- Do not store items in suspension harness system (interferes with shock absorbtion)
- Do not expose to chemicals or heat
- Do not drop or sit on it
- Do not engrave it
- Do not place heavy items on top of it or pack it too tightly
- Do not allow it to impact sharp or pointed objects
- Use only approved stickers (water based adhesive) in approved locations

Inspection for function

Operational Inspection:

- Ensure chin strap buckle closes and clicks
- Adjustment wheels move freely and affect the fit of the headband.
- Ensure a proper fit by adjusting the apex of the chin strap. Make sure it sits under your earlobe (this is sometimes difficult while on your head)
- Check helmet accesory attachment points are functional.

Inspection for wear

Visual and Tactile Inspection:

- Suspension system and straps – nicks, cuts, tears, stitching damage. Evidence of paint, chemical and heat damage
- Shell - cracks (especially on the rim), pitting and discoloration, abrasion and gouging
- Confirm specifications and tracking information (unique number) are present

DESCENDING DEVICE-PETZL I'D

"Self-braking descender with anti-panic function and multi-function handle that allows descent control, easier movement on inclined or horizontal terrain and positioning at the work station without the need to tie off the device. The anti-panic function only activates if the user pulls too hard on the handle. The I'D S descender has an anti-error catch to reduce the chance of an accident, and a gate that helps prevent dropping the device and facilitates rope installation when passing intermediate anchors."

PETZL

Descending devices are used to descend or 'abseil' down a rope. The device relies on friction for a controlled descent or lower. Standards for descending devices are:

- EN 341 classe A
- CE EN 12841 type C
- ANSI Z359.4
- NFPA 1983 Technical Use, EAC

Foreseeable Misuse

- There is always the potential to load the I'D backwards. Look at the pictures on device and be sure rope matches.
- Ensure your faceplate is fully closed before attempting to rely solely on I'D.
- If the carabiner is cross loaded when you change over, keep your fingers clear. Use your hand ascender and foot loop to correct it.

List the primary functions and features

- Rope adjustment device (for descending the working line)
- Attended back up (belay) device
- Progress capture device – hauling and tensioned rope systems

Features:

- Self braking
- Panic stop mechanism
- Wear indicator
- Anti-error catch
- Useful as hauling clutch

List the proper handling and use

- Load rope correctly and check that the side plate catch is closed and locked (Rope Diametre 10 >11.5)
- Rope must run over rolled edge of I'D body when descending
- Additional friction carabiner must be used when device is inverted (i.e. lowering from above) and is recommended when it is in an otherwise awkward operating position, or a two person rescue.
- Protect device while using near structure and edges
- Watch for cross loaded connecting carabiner
- Do not operate handle of ID without control of the brake rope

Dynamic Loading Considerations:

- Rope will slip (and reduce force) under an excessive load, at approximately 6.5kN

Load ratings:

150Kg working load
200kg rescue load with added friction and proper training
200-250kg with 2 added friction points

Inspection for function

Operational Inspection:

- Check housing plate locking latch
- Check hinge and housing cover for proper closure
- Operate handle and observe cam for function
- Move toothed cam to confirm it's free moving

Inspection for wear

Visual and Tactile Inspection:

- Check wear indicator on cam body (only on the old I'Ds)
- Check carabiner connection point
- Look and feel for cracks and deformation on body
- Confirm specifications and tracking information are present

FALL ARREST DEVICES & LANYARDS - Petzl ASAP Lock + Sorber'Axcess Lanyard

"Mobile fall arrester with locking function. In normal use, the device moves freely along the rope without any manual intervention and accompanies the user in all his movements. In case of shock or sudden movement, the fall arrester locks on the rope and stops the user. The ASAP LOCK's integrated locking function allows the user to immobilize the device to reduce the length of a fall. The ASAP LOCK is used with an energy absorbing lanyard to work at a distance from the rope."

- ANSI Z359.13
- CE EN 353-2
- CE EN 12841 type A, EAC

Sorber'Axcess

Shock absorber Length

40cm

Length after deployment

253cm

Foreseeable Misuse

- Always use ASAP/ASAP Lock with a shock pack. Be sure you know which shock pack you are using and whether or not it is rated for rescue.
- Function test the device to ensure the locking function works.

List the primary functions and features

Rope access Mobile Fall Arrester (self trailing) - can be used in hauling or lowering systems.

- Difficult to defeat during normal use (okay to handle body of device)
- Uses shock absorber to absorb impact force consistently
- Shock absorber provides consistent deployment distance
- Placing on or above an obstacle does not defeat or reduce performance of ASAP/ASAP Lock
- ASAP LOCK may be used for 2 person rescue with compatible energy absorber (Absorbica L57 or ASAP'SORBER AXESS)

List the proper handling and use

- Manage ASAP in highest practical position (be aware of clearance)
- Keep shock pack riding above arm in ascent and descent.
- Engage locking function as needed to maintain device in a high position – slip "blocking" knot is an alternative.
- ASAP must be connected to workers Sternal or Dorsal D ring on harness.
- Energy absorber connected to harness using Petzl Triple Action auto locking carabiner.
- Do not bend the energy absorber when carrying it on the harness – doing so will damage it.
- Do not extend length of shock packs against manufacturers specifications.
- Do not load an ASAP with body weight, especially a 2-person rescue load as it may begin to deploy the stitching on the shock pack.
- Risk assess before use in high winds, potential risk for rope to "run" through the device; this is the reason for the "lock" button.

Inspection for function

- Function test gates and inspect for wear on the carabiner.
- Function test spring on wheel assembly for free movement.
- Function check that wheel rolls smoothly in both directions on rope.
- Function check that wheel engages and can be released.

Inspection for wear

- Must have rubber 'STRING' retainer in place
- Inspect shock pack lanyard for any ripped stitching on "safety stitching" that would indicate a prior shock load.
- Inspect webbing along lanyard and at carabiner connection points for wear or damage
- "Shake" device to listen for free moving pins inside. (no sound= possible damage to internal mechanism)
- Confirm energy absorber has not been activated; indicator stitching
- Inspect body of device (visual and tactile) for wear, damage or deformation. Use comparison check with new device if necessary.
- Confirm specifications and tracking information are present.

ASCENDERS

"Handled rope clamp is designed for rope ascents and features an overmolded grip and ergonomic upper part for a comfortable and powerful grip when pulling with one or two hands. The ASCENSION handled rope clamp has a wide lower hole for easily attaching two carabiners for a lanyard and footloop. Rope compatibility: 8 to 13 mm."

PETZL

Ascenders are used to climb up a working rope and should be easily attached. The teeth that grip the rope should detach easily on upward movement so that damage to the rope is avoided. On no account should a dynamic load be placed on the ascenders, as severe damage to the working rope and the ascenders will ensue. Hand Ascenders should always be connected to a Device Lanyard.

- CE EN 567
- CE EN 12841 type B, EAC
- NFPA 1983 Technical Use

CROLL

Chest ascender is designed for rope access and rescue professionals, the CROLL chest rope clamp is very compact and lightweight. The rope channel is reinforced with stainless steel for greater durability.

- Rope compatibility: 8 to 11 mm
- Certification(s): CE EN 567, CE EN 12841 type B, EAC

? List the primary functions and features

- Ascending working rope in tandem with chest ascender or second handled ascender
- Rope clamp/adjustment device – progress capture in a pulley system

Features:

- Toothed cam to minimize slippage while ascending
- Positive lock on cam to prevent rope from disconnecting
- Molded plastic hand grip for comfort

List the proper handling and use

- Use with chest ascender (Croll) and foot loop for ascending
- Use with working parts facing you to minimize damage near structures
- Do not shock load a toothed device. Shock loading can damage rope, hardware and cause injury to worker. Rope damage can be expected with a force downwards of around 4Kn.
- Do not load cam in bottom of loop or on an angled tensioned rope. Upward tension on cam can damage rope or device – if unavoidable then attach lanyard with a karabiner through the front attachment hole to capture the rope within the krab
- Do not cross load handle over an edge
- Do not use without a lanyard (when used as a personal ascending device) – max length 1m including connectors
- Do not use plastic catch to release the cam for movement down the rope (risk of detachment)
- Do not use on wire rope
- Do not load the frame (i.e. across the attachment point/s)

Inspection for function

Operation Inspection:

- Move cam checking for smooth motion and spring action
- Check spring action on locking mechanism
- Pull down on handle while installed on rope to confirm lock is functioning

Inspection for wear

Visual and Tactile Inspection:

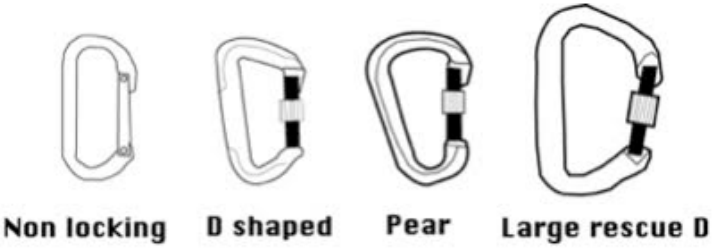
- Check teeth for wear and grit
- Look for deformation on body especially rope housing
- Feel for burrs or sharp edges especially at metal on metal connection
- Confirm specifications and tracking information are present

CONNECTORS

Connectors is the term used to describe a class of metal links used to connect components. Carabiners, screw-links, and scaffold hooks are the main types of connectors used in rope-access and fall protection systems. Connectors are fabricated from steel, aluminum, and various alloys.

Steel connectors are the most common in industry because of steel's durability, strength, and relative low cost.
Aluminum is chosen for its high strength to weight ratio, making connectors that are lighter than steel.
Connectors used for life safety applications must be designed for this use.

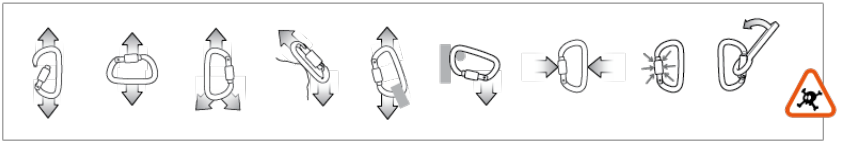
Usually such equipment will be stamped with an MBS, and will require some calculation to determine an SWL.



Minimum accepted strengths:

- IRATA – screw link connector along major axis with gate closed/locked will be 25KN
- SPRAT – screw link connector along major axis with gate closed/locked will be 22KN or 5000lbs

Examples of dangerous carabiner loading!!



A carabiner is designed to be loaded on its major axis, with the gate closed and the sleeve locked. Only the strength rating for the major axis with gate closed is suitable for the loads sustained by a carabiner in vertical activities.

Loading a carabiner in any other way can be dangerous.

The Am'D lightweight asymmetrical carabiner is made of aluminum. It has a D shape particularly suited for connection to diverse equipment such as descenders or positioning lanyards.

OXAN is a high-strength steel carabiner designed for use in difficult environments. The oval, symmetrical shape allows optimal loading of the carabiner when setting up anchors or connecting to metal structures.
SCREW-LOCK: the manual screw-lock with red band provides a visual warning when the carabiner is unlocked!

VULCAN is a high-strength steel carabiner designed for use in difficult environments. The large-capacity asymmetrical shape is ideal for setting multiple anchors. Typically used as an achor connector.

PETZL

"Connectors with a gate locking mechanism such as a screwed sleeve or an automatic locking mechanism are the only types that can provide the required level of security for use in rope access."

IRATA ICOP 2.7.4.1

Inspection for function and wear

Operational Inspection:
- Open gate to confirm smooth function
- Release gate to confirm smooth and complete closure of locking mechanism (if screw gate, twist lock sleeve and then give squeeze test)

Visual and Tactile Inspection:
- Look for deformation, pitting or material loss; especially where rope would run
- Feel for burrs, corrosion or material loss
- Confirm specifications and tracking information are present

COWS TAIL (DEVICE LANYARD)

Cow's tails are used to connect the technician's harness to the safety line via the backup device or to an anchor point for climbing techniques, such as aid climbing and should therefore be able to sustain a dynamic shock loading. Cow's tails are constructed from single 10.5/11mm dynamic ropes.

PETZL JANE

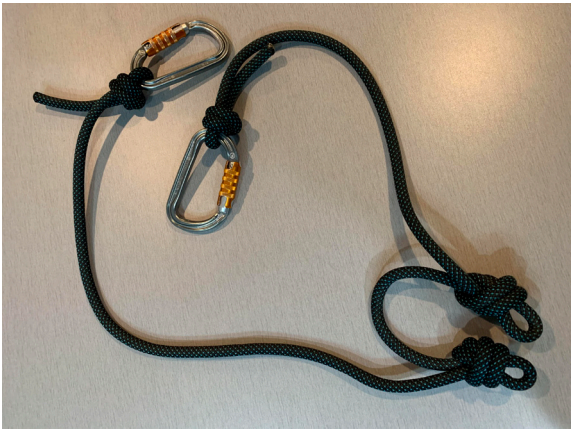
Non-adjustable dynamic rope lanyard

- Certification: CE EN 354, EAC

"Device lanyards and anchor lanyards should be able to withstand any dynamic forces that might be placed upon them in times of emergency."

IRATA ICOP 2.7.8.2.1

YOU COULD ALSO TIE YOUR OWN COWSTAILS:



"Knots to be used for the terminations should be chosen for their energy absorbing characteristics as well as their strength and should be tied only by competent persons. The energy absorption provided by the materials used in the construction of the lanyard is enhanced by the knots used to terminate them and knotted terminations are therefore recommended. An example of a knot that is particularly good at absorbing energy is the scaffold knot (often referred to as a barrel knot)...which is frequently used in the end of the anchor lanyard... It is good practice to re-tie, dress and set (i.e. hand tighten) knots periodically as part of the inspection process."

IRATA ICOP 2.7.8.2.1

List the primary functions and features

- Device lanyards to ensure you don't drop important PPE (ie. Hand Ascender)
- Point of connection for restraint/positioning
- Dynamic rope to absorb force in a fall
- Sewn terminations maintain 100% of the lanyards strength
- Tied cowstails provide more energy absorption than sewn, but less overall strength

List the proper handling and use

- Always leave equipment attached to cowstails
- Do NOT position greater than FF1
- Avoid sources of abrasion/heat and sharp edges
- Store on harness in such a way to avoid tripping hazards or snags
- Keep length within arms reach.
- Can be washed by hand, or daisy chained and put in a front loading washing machine (without an agitator). The daisy chain will ensure it doesn't become tangled.
- Hang the ropes to dry in a cool well ventilated area away from direct sunlight.
- Cowstails from Petzl have a lifespan of 10 years. Ropes should be traceable to the date of manufacture and date of first use to keep track of this.
- If tying your own cowstails it is important to untie and re-tie them to ensure the knots do not become over tightened.
- Ropes are best maintained and moved in Rope Bags. This will protect them and also ensure ease of use and limited snags.

Inspection for wear

- Look for abrasion on sheath
- Feel for hard spots on sheath indicating chemical or heat damage
- Roll rope through fingers to feel for core integrity
- Confirm specifications and tracking information are present

If sewn terminations, pull back plastic sleeve and inspect stitching. it should be straight and not at an angle (which would imply a hard shock load) and should be completely intact.

Adjustable Lanyards

GRILLON

The Grillon adjustable lanyard is used to make work positioning systems, to complement a fall-arrest system. Its length can be very easily and precisely adjusted as necessary for comfortable positioning at the work station. Depending on the configuration, it can be used in single or double mode.

- Certification(s): CE EN 358, EAC

Progress Adjust I

PROGRESS ADJUST-I is a single adjustable progression lanyard that allows, when combined with another lanyard, continuous connection for all types of progression (rope ascent, movement along a lifeline...). Thanks to the ADJUST rope adjuster, the length can be quickly and easily adjusted. The connector is held in the correct position for easy clipping.

- Certification(s): CE EN 358, EAC

NOW IT'S YOUR TURN!! LET'S SEE WHAT YOU'VE GOT!

? List the primary functions and features

List the proper handling and use

Inspection for function

Inspection for wear

ROPES – LOW STRETCH 'KernMantle' ROPE (Working & Safety ropes)

The standard EN 1891 covers two types of low stretch rope. For the purposes of Rope Access intervention, Type A, will only be used. It should be noted that low stretch ropes of this type are not designed to withstand a major dynamic loading. In cases where a dynamic loading is a risk, a single dynamic mountaineering rope shall be used (EN 892). In order to terminate a rope, technicians will commonly use a knot to attach the rope to an anchor point. Under EN 1891 standard, Type A rope must have a static resistance of 2200kg (22KN) and when terminated with a figure of 8 knot it must have static resistance of 1500kg (15KN).

Both low stretch / semi-static and dynamic ropes are of kernmantel construction. The kern, or core, is the inner part of the rope and this is where the bulk of a rope's strength lies. The mantel, or sheath, is the outer part and is there to protect the core. The greater absorbing capability of Dynamic rope comes from the twisted construction of the fibers in the manufacturing phase – the stretch is basically the fibers (Nylon/Polyester) trying to untwist.

Here at Pacific Ropes, we are currently using Marlow 11mm Static LSK ropes, which, of course, is an EN1891 Type A rope, has an elongation of approx 3% for 100kg load and has a static strength of 35.3KN (3530kg or 7782lbs).

List the primary functions and features

Life support system for main line and back-up. Also used for hauling and lowering.

Nylon

- 10% stronger than polyester (by weight)
- Better at absorbing forces (shockload) than polyester
- Resistant to many chemicals
- 10-15% weaker when wet
- Acid and bleaches can damage rope

Polyester

- Similar strength when wet or dry
- More acid resistant than nylon
- Low elongation (less shock absorption)
- Alkali degradation

List the proper handling and use

- Protect rope from unnecessary abrasion.
- Inspect the rope after each use.
- Maintain a rope log.
- Wash and dry dirty ropes.
- Coil or bag rope after use.
- Store ropes where they will not be exposed to UV rays, high temperatures, chemicals or humidity.
- Avoid stepping on ropes. Grit can become embedded in the rope sheath and work its way to the core. Embedded dirt and grit will cut the nylon fibres and compromise the strength of the rope.
- Avoid prolonged exposure of ropes to sunlight. It has been demonstrated that ultraviolet radiation adversely affects the strength of ropes and webbing.
- A wet rope should never be left in a rope bag. Ropes should be dried in a ventilated area and not over a campfire or in a clothes drier. Excessive heat damages the nylon making the rope weaker.
- Nylon on nylon connections should be avoided. Loaded moving rope running across stationary rope or webbing is extremely dangerous and can result in the cutting away or melting of the non-moving length of nylon. Do not run a moving loaded rope against a non-moving length of rope or webbing.
- Rope kinking can potentially result after several rappels, belays or coilings. Unchecked, kinking can turn a length of rope into a rescuer's nightmare. The use of in-line devices, that do not twist the rope is recommended. Proper coiling and uncoiling methods are also of value in keeping twists out of the rope.

Inspection for function and wear

Operational Inspection-Function:

- Confirm rope length and diameter is suitable for rigging needs and compatible with devices used.

Visual and Tactile Inspection-Wear:

- Look for abrasion on sheath
- Feel for hard spots on sheath indicating chemical or heat damage
- Roll rope through fingers to feel for core integrity
- Confirm specifications and tracking information are present

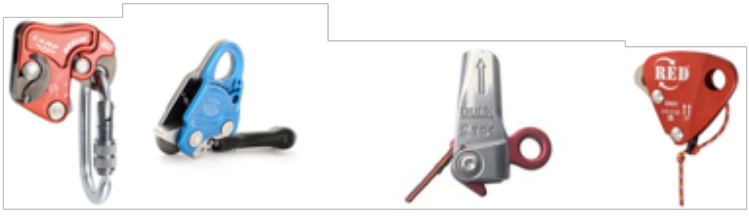
BACKUP DEVICES

Back-up' devices are used to attach the worker to the safety line. Sometimes the worker will be attached to the device directly, via a carabiner or alternatively with a device lanyard as well. A back up device used in rope access will typically be a:

- Mobile fall arrestor (EN 353-2) or a
- Device conforming to EN 12841-A

CAMMING BACK UPS!!!

The "camming" style of back-up devices come in many different shapes and sizes. They are used to attach the worker to the safety line. Sometimes the worker will be attached to the device directly, via a carabiner or alternatively with a device lanyard as well. A back up device used in rope access will typically be a mobile fall arrestor (EN 353-2) or a device conforming to EN 12841-A.



Foreseeable Misuse

The main hazard this style of backup device all share is known as "panic grabbing". Should there be a working line failure, it's a natural reaction for us to grab something as we fall. If we were to grab any of these devices by the body then they WILL NOT engage. Therefore, the device should always be in its highest position on the rope (fall factor 0) and should be operated in a 1:1 fashion from the descender, (moved independently) especially when clearance distance is a concern. Keep attached to your sternal connection for upright positioning in case of a fall onto the back-up. Don't use DUCK/KONG directly above a knot. Leave enough room for the device to slip in case of catastrophic mainline failure. The 'towing' of any back-up device that works by means of a camming action should be thoroughly risk assessed and technicians should refer to the manufacturers instructions. Tow only by the manufacturers cord. If replaced, it must be kept short.

KONG BACK UP

KONG fall arrester will follow the operator in both directions. Shifting the special button on the lock mode, it can be used also as a positioning device or a normal locking device.

- EN 353-2
- EN358
- EN567
- EN12841 A/B

This backup device (Kong 800), should be operated in a 1:1 ratio, moved independently to the operation of a descending device when clearance distance is a concern.

The Kong back up comes with it's own oval carabiner. Made of carbon steel with a wide-opening, it can hold up to 40 KN, which makes it ideal for heavy duty use.
The main key feature includes the reinforced sleeve, which offers greater resistance in the case of lateral stress, as required by ANSI.

List the primary functions and features

- Rope access Back-up device (towed device)
- Maintains position when placed high on safety line
- Smooth cam absorbs impact force by sliding down rope and decelerating the fall (slippage at approx. 3kn)
- Dedicated pull string for moving down (independent of descending device)

List the proper handling and use

- Perform a basic function test every time device is placed on a rope.
- Keep back up as high as practical to minimize fall distance
  - Above shoulder height or higher is best
  - Beyond FF1 - slightly below its connection point to the harness (sternal D connection) is a minor discrepancy
  - At or below central D ring is a major discrepancy
- Do not defeat operation of device. Examples of defeating are:
  - Handling the body
  - Grabbing the rope above it
  - Pulling the tow string while descending
  - Putting the device on upside down

Inspection for wear

- Look at aluminum cam for material loss at rope contact (1.5 mm max allowed wear)
- Look for deformation or material loss on body and carabiner connection point Feel for burring
- Confirm specifications and tracking information are present.

CHAPTER 5
PRACTICAL MANEUVERS

Pacific Ropes™

ACCESS THROUGH INNOVATION

Photo Credit: Tim Zagiel
Granville Bridge, Vancouver, BC

The first thing to point out here is to reinforce the importance of gaining access AND egress to and from your ropes. This MUST be done from a safe area where there are absolutely ZERO hazards or NO exposure to any potential fall from height.

Ascending/Descending with Ascending System:

- Approach a set of lines.
- Inspect rigging and be sure ropes are not twisted.
- Enforce good rope management habits, dress back-up line to the left, main line to the right.
- Install appropriate back-up device on back up line (to the left)
- Install CROLL and Handled Ascender onto Main line.
- Sit in your harness and be sure to find the plumb line before beginning to ascend.
- Place your desired foot into the foot-loop attached to the handled ascender.
- Making sure your ASAP LOCK lanyard is over your left shoulder, hold the top of the handled ascender with your left hand.
- Hold the handle of the Handled Ascender with your right hand.
- Simultaneously push the handled ascender up the main line and raise your chosen foot with the foot-loop.
- Stand straight up remembering to keep your hips above your foot and leaning your chest into the rope. (This will help guide the main line rope through your CROLL as you ascend to capture progress.)
- Repeat these steps until you have reached the top or desired height.

Descending with Ascending System:

In some cases, you may need to descend slightly without changing over completely, you can do this while still in ascent by following these steps;

- While in suspension, dress your main line over your left leg, so now both lines should be on your left side.
- Move your hand ascender as low as it will reasonably go while still sitting above your croll.
- Reach high up the rope above your hand ascender with your left hand and stand up in your foot-loop.
- Be sure your hips are above your foot and chest leaned in to the main line.
- This motion, when done effectively should have unweighted your CROLL from the main line.
- DO NOT REMOVE YOUR CROLL!
- Use the pointer finger of your right hand to push down on the CROLLS toothed cam from above, do not touch the black handle.
- This will allow you to move carefully down the rope, be sure not to get out of reach of your handled ascender.
- Allow the CROLL to engage on the rope, move the handled ascender down and then repeat these steps.

Ascending/Descending with Descending System:

- Approach a set of lines.
- Inspect rigging and be sure ropes are not twisted.
- Enforce good rope management habits, dress back-up line to the left, main line to the right.
- Install appropriate back-up device on back up line, (to the left)
- Install I'D onto the main line.
- Add Hand Ascender and footloop on to the main line ABOVE your I'D.
- Sit in your harness to find your plumb line before beginning to ascend.
- Place desired foot into the foot loop attached to the Hand Ascender.
- Making sure the ASAP LOCK lanyard is over your left shoulder, hold the top of the Hand Ascender with your left hand.
- Hold the tail rope from the I'D with your right hand, and unlock the I'D handle.
- Stand in the footloop while simultaneously pulling the tail rope through the I'D with your right hand.
- Reset the hand ascender (push it up the rope) and repeat the last step until you reach your desired height. *LOCK YOUR I'D HANDLE!*
- When ready to descend, simply remove handle ascender from the main working line, and tidy up your footloop for storage on the harness.
- Double check that your ASAP lock is moving freely and unlocked.
- Dress the tail rope over the rope guard on the I'D and begin to descend.

Change-over from Ascending System into Descending System:

Typically, you won't want to descend in your ascending gear, or ascend in your descending gear, so changing between the two systems at height will be the foundation of the rest of your maneuvers.

- Once you have reached your desired height in your ascending gear, you will want to change over to your descending gear.
- If you ascended in your KONG or Duck back-up, change it out now for your ASAP LOCK, and make sure the button is not in the locked position and it is moving freely.
- Install your I'D onto the main working line UNDER your CROLL.
- Pull through the slack so that the top of the I'D sits as close to the bottom of your CROLL as possible, and move the hand ascender down to just above the CROLL, so that all of your equipment is close together.
- Be sure your ID is loaded correctly and the handle is LOCKED.
- Reach high up the rope with your left hand so your arm is straight and stand up in your footloop.
- This should disengage the CROLLs teeth from the rope.
- Remove your CROLL and sit into your I'D
- Tidy up your footloop and store in on your harness.
- Descend with proper handling technique until your feet touch the ground!

Passing a Deviation (Single and Double):

REMEMBER – TIE A RETRIEVAL SLIP KNOT!

- Approach deviation lines.
- Remember to tie a retrieval knot, double alpine butterfly, or double slip knot in order to get back on your descent.
- Ensure the ropes are not twisted and;
- Install ASAP on back up line.
- Install hand and chest ascender on main working line.
- Ascend to the deviation.
- Push the deviation anchors up to get more height. (DO NOT put hand ascender above the deviation.)
- Use the pre-rigged Grillon to position yourself towards the deviation anchor, attach it to your ventral D-ring.
- This will make the deviation slings come loose above you.
- If it is a single deviation, simply remove the deviation and re-install it below all your ascending gear. (The Grillon will hold you in position)
- If it is a double deviation, remove one sling at a time and make sure it is re-installed below before moving the second one.
- Lower out the Grillon, remove it from your ventral D-ring and leave it behind for your descent.
- Carefully lower yourself out to find your plumb line, and continue ascent to the anchors.
- Changeover.
- Descend to eye level with the base of the deviation anchors.
- Pull yourself in on the retrieval knot in order to grab the Grillon.
- Attach Grillon to your ventral connection and pull in slack.
- You may need to adjust descend slightly on your I'D for better positioning.
- Remove deviation sling from below and attach it above all of your descent equipment.
- If Double; move slings one and at a time.
- Disconnect Grillon and descend to the ground.

Personal Notes/Things to remember:

Rope-to-Rope transfer (>1.5m apart):

REMEMBER – YOU MUST MAINTAIN 4 POINTS OF ATTACHMENT DURING THE TRANSITION FROM ONE SET OF ROPES TO ANOTHER!!

- Attach desired Transfer ropes to harness for easy retrieval.
- Approach Primary ascending lines.
- Install ASAP lock on Primary backup line.
- Install Croll followed by Handled Ascender on Primary working line.
- Ascend Primary lines about half way to top.
- CHANGE-OVER!
- Once, and only once you are in descent on your primary working line can you start to install your secondary system onto transfer ropes.
- Install secondary backup onto transfer backup line.
- Install CROLL and Hand Ascender onto transfer working line, DO NOT FORGET YOUR HANDLED ASCENDER!
- Confirm that you have a full FOUR points of contact.
- Pull tension into your new ascending system, including your backup, on transfer lines and then;
- USE GRAVITY, descend your primary working line until you find the plumb line of your transfer ropes. (If you start to come too close to the ground you may have ascend on your transfer lines.)
- Only once you have completed the transition, meaning your I'D is not supporting any weight at all, can your primary system be removed from primary lines.
- Remove I'D and ASAP from primary working lines and now your transfer ropes have become your primary ropes.
- Changeover and descend safely to the ground. (Here you may decide to change your secondary backup for your ASAP lock for a smooth descent.)

Personal Notes/Things to remember:

Re-anchors (<1.5m apart): IRATA only!

REMEMBER – GOOD ROPE MANAGEMENT IS KEY HERE FOR MANEUVERING THROUGH THE LOOP OF SLACK ROPE!!

- Think Rope-to-Rope with a loop.
- Approach standing lines. (Lines to the ground)
- Install ASAP Lock on Back-up line, and CROLL and Handled Ascender on Main Line.
- Ascend to anchors.
- CHANGE-OVER into descent ON the standing lines.
- This is the critical moment for rope management.
    - Check that your standing lines are on one side of you, and the looped rope is on the other side, nice and clean with no tangles.
- Now you begin the steps of a rope-to-rope to the FAR side of the loop.
- Install your secondary backup onto the far side of the loop on your backup line. (Maintain good rope management)
- Install your CROLL and *Handled Ascender* onto the far side of the loop on your main working line. (Maintain good rope management)
- Confirm that you have a full FOUR points of contact.
- Pull gentle tension through the CROLL and descend into the far side of the loop.
- Once under your new set of anchors on the far side of the loop, you can remove your I'D and ASAP lock.
- Ascend to the top.
- Changeover into Descent.
- Now would be a good time to switch into your ASAP lock for your descent, *though this is not necessary.*
- Descend the loop rope until you are eye level with the Re-anchor anchors.
- Think about your rope management again here. Get the loop off to one side, and the standing lines will come from the other side for you transfer.
- Grab standing lines and install your new back-up and your CROLL and *Handled Ascender* onto the standing lines.
- Confirm that you have a full FOUR points of contact.
- Begin descending into the standing lines, being mindful of where the bottom of your loop is. Do NOT get stuck. We will bring out the ladder of shame.
- Once directly under your new set of anchors, you can remove your I'D and ASAP from the far side of the loop.
- Changeover to descent and come to the ground.

Personal Notes/Things to remember:

Large Re-anchors (>1.5m apart): SPRAT only!

REMEMBER – THIS IS THE SAME AS A ROPE-TO-ROPE TRANSFER, SO MAINTAIN YOUR 4 POINTS OF CONNECTION THROUGHOUT THE TRANSITION!!

- Think Rope-to-Rope INSIDE a loop.
- Approach standing lines.
- Install appropriate back-up on to back-up standing line.
- Install CROLL and Handled Ascender on main standing line.
- Ascend to the anchors.
- Here is another critical time to be aware of ROPE MANAGEMENT.
- Decide which position will be most comfortable for body positioning and try to remain in the body position throughout the entire length of the transfer, this will ensure your rope management stays where it is, turning around and shifting body position will tangle your ropes through this maneuver.
- Dress your standing lines off to one side (away from the loop)
- Install your ASAP lock onto the backup line inside the closest side of the loop to you.
- Install your I'D on the working line onto the closest side of the loop, on the main line.

(This will feel like a rope to rope but is really just a changeover from one rope to another because both your standing lines and the first side of the loop will be coming from the same knot, therefore there is NO swing potential, and does not require the full rope-to-rope sequence.)

Remove your CROLL and backup from the standing lines. In this moment, the standing lines should be completely free and off to one side. Be sure that they don't come with you while transitioning through the loop.

- Now you can begin your "rope-to-rope" to the far side of the looped rope.
- Pull the far side of the loop towards you and install your secondary back up ensuring that it will protect you from the far side in case of a main line failure and swing once you are transitioning through the loop.
- Pull the main line from the far side of the loop towards you and install it into your CROLL. DO NOT forget your HAND ASCENDER.
- Double check that you have all FOUR of your points of connection.
- At this point you should ascend towards the far side of the loop as far as you can (Minding that your angle does not exceed 120°)
- Once you have reached your maximum height, descend through the loop, once again minding the bottom of the loop. DO NOT lower all the way into the bottom of the loop.
- Balance between descending and ascending until you reach your plumb line under the far side anchors.
- Once completely plumb, you can remove your I'D and ASAP lock.
- Install your I'D and ASAP Lock onto their respective lines on the standing lines you have now transitioned to.
- Once again minding that you do not install any gear over top of the loop as this will create tangles that could get you stuck.
- Complete your changeover onto the Standing lines, removing all gear from inside the loop and descend to the ground.

Passing mid rope knots:

REMEMBER – YOUR CHEST ASCENDER (CROLL) IS ALWAYS ATTACHED TO THE WORKING LINE ABOVE YOUR DESCENDER (I'D), ALWAYS, ALWAYS, ALWAYS!!

- Approach a set of lines.
- Install appropriate back-up device on back-up line.
- Install CROLL and Handled Ascender on main line.
- Ascend ropes to the top.
- Below you, about half way down the ropes, tie two Alpine Butterfly knots about half way down lines, as close to in line with each other as possible.
- CHANGE-OVER!
- Descend lines until your I'D is an inch or two above the knot, DO NOT DESCEND RIGHT INTO THE KNOT.
- Change-over again, YOUR CROLL ALWAYS GOES ABOVE YOUR DESCENDER.
- Once in your CROLL, the descender can be disconnected and re-installed below the knot.
- Once descender is installed below the knot, it is important to DOWN-CROLL in order to shrink up the gap between your CROLL and Descender.
- Before removing your CROLL and committing into your Descender, check your backup line and ask yourself two questions;
    - If you transfer into your I'D, will your ASAP Lock get stuck on top of the knot in your back-up line?
    - If you put your secondary backup under the knot, will you have a fall factor greater than 1?
- If you answered yes to the first question, install your secondary backup below the knot now.
- If you answered yes to the second question, commit to your I'D and THEN install your secondary backup below the knot.
- Remove your CROLL; commit to your I'D. Remove Handled Ascender.
- Remove ASAP from above knot and carry on your descent to the ground.
- Change over to ascent again, and begin climbing toward the knots.
- Once you reach the knot, it is permissible to remove your hand ascender and re-install it above the knot to gain extra height on your CROLL.
- Ascend until your CROLL is an inch or two from the bottom side of the knot.
- If feasible, Install your ASAP lock above the knot, (you may have to pass the knot in your main line first, be aware of your fall factor)
- Install your I'D below your CROLL and shrink up the gap.
- Remove CROLL and in one motion stand up high and install the CROLL above the knot. (The descender is just a back-up while you make this transition.
- Once above the knots, remove all gear from below them, untie them, changeover, and descend to the ground.

Practical Maneuvers:

Personal Notes/Things to remember:

Pick-off Descent Rescue: (IRATA)

The Level One Rescue for IRATA is performed from an adjacent set of ropes. The Casualty is positioned in descent mode, approximately half way down a set of lines. The rescuer could approach from above or below on a seperate set of lines.

- Ascend or Descend a set of ropes to position yourself slightly higher than the casualty, on a separate set of ropes
- If you ascended, CHANGE OVER into your I'D
- If you descended, stay in your descender (; (be sure that your I'D carabiner is in the correct orientation. (Ask your instructor what this means)
- Dress your ropes one to the right and one to the left, DO NOT have the ropes between your legs.
- Make your first point of connection to the casualty, at Pacific Ropes we steal the casualties Kong or Duck Lanyard and connect it to our Ventral D-ring.
- Make your second point of connection to the casualty. This connection will be no more than two linked carabiners from the spine of the rescuers I'D carabiner, to sternal D-ring of the casualty.
- DOUBLE CHECK your two connection and be sure that the casualties ASAP is free running and NOT locked.
- Operate the casualties I'D and lower them on to your system. You are now one unit.
- Remove the casualties I'D and ASAP LOCK and assume the 'Position of Power'
- Assuming your rope management stuck from step 3, you should have your main working line over your right side and your back up rope to the left.
- You will now add your extra friction carabiner to your descent line.
- Double check that your own ASAP is free moving and not locked.
- Descend to the ground utilizing your friction carabiner.
- Assuming that your I'D 'biner is oriented correctly, you should now be able to escape the system and leave your casualty slightly suspended.

Personal Notes/Things to remember:

Level One Rescue Scenario: (SPRAT)

SPRAT Level one's are expected to be able to rescue their casualty out of Ascent mode, change them over to Descent mode, and then continue the Rescue the same way as IRATA. The only difference then is the change-over for the casualty. This rescue scenario also takes place from an adjacent set of ropes.

- Ascend or Descend a set of ropes to position yourself slightly higher than the casualty, on a separate set of ropes
- If you ascended, CHANGE OVER into your I'D
- If you descended, stay in your descender (; (be sure that your I'D carabiner is in the correct orientation. ((Ask your instructor what this means)))
- Dress your ropes one to the right and one to the left, DO NOT have the ropes between your legs.

- *The Casualty is in their Ascending system, so now you will need to install their own I'D on the main working line, below the CROLL.*
- *Leaving the handled ascender on above the CROLL, install a new carabiner into the top hole of the Handled Ascender.*
- *Detach the footloop and extend it fully. Attach the connection end with a carabiner to the casualties sternal d-ring.*
- *Run the footloop up and over the carabiner you added to the top of the handled ascender.*
- *Put your foot in the footloop and stand straight up on to it, creating the counterbalance necessary to lift the casualty.*
- *While standing straight up, find your balance and grab the casualties harness to LIFT them up. Remove the casualties CROLL and close it.*
- *Lower the casualty onto their I'D.*
-
- Make your first point of connection to the casualty, at Pacific Ropes we steal the casualties Kong or Duck Lanyard and connect it to our Ventral D-ring.
- Make your second point of connection to the casualty. This connection will be no more than two linked carabiners from the spine of the rescuers I'D carabiner, to sternal D-ring of the casualty.
- DOUBLE CHECK your two connection and be sure that the casualties ASAP is free running and NOT locked.
- Operate the casualties I'D and lower them on to your system. You are now one unit.
- Remove the casualties I'D and ASAP LOCK and assume the Position of Power.
- Assuming your rope management stuck from step 3, you should have your main working line over your right side and your back up rope to the left.
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- Double check that your own ASAP is free moving and not locked.
- Descend to the ground utilizing your friction carabiner.
- Assuming that your I'D 'biner is oriented correctly, you should now be able to escape the system and leave your casualty slightly suspended.

Passing edge obstruction or rope rigged at 90 degrees:

Recognizing and understanding hazards in any working environment is very important. Any kind of situation where your ropes are going to be rigged over a sharp edge or may have the potential to come in to contact with a sharp edge, should be taken very seriously.

First, we WILL IDENTIFY the hazards, such as the sharp edge. The most ideal solution is to REMOVE the hazard completely. If that is not an option, then we WILL AVOID the ropes from any potential contact with the sharp edge by using various rigging techniques. If we can't achieve either of those methods then we WILL PROTECT the ropes using the appropriate rope protectors. Lastly, we WILL VERIFY to make sure our level of protection is robust and appropriate.

We will cover and demonstrate various examples and techniques in dealing with these potentially fatal hazards that you WILL come across out there in the field.

Personal Notes/Things to remember:

Edge Obstruction at the Top/Negotiate Edge

Not only is the edge itself a hazard, but the transition from sitting on the edge and transitioning over opens us up to mis-use of the equipment and panic. it is also common to load your descender backwards in this maneuver. This maneuver will require careful attention and an effective FUNCTION TEST.

- When approaching an exposed edge, it is important to note the local legislation regarding how close to an unprotected edge you are able to be without any form of fall protection. Typically, that distance is 2m or 6.5ft.
- As you approach the edge, staying protected is paramount. Use the fall arrest lanyard provided, or attach yourself with two connections to the horizontal lifeline.
- There will be two alpine butterfly knots closer to the edge, on the rope system. Transfer your connection points to those alpines, one on each rope
- Kneeling down beside the edge, install your ASAP lock on the back-up rope, below the alpine butterfly. FUNCTION Test ASAP to ensure proper orientation.
- Reach just below the edge, and pull up the main line from below the obstruction, this will ensure your descending device handle does not get trapped on the corner.
- Install the rope into the I'D, ensuring the correct orientation of the tail rope and anchor line, once again PERFORM A FUNCTION test to ensure proper loading.
- Lock the I'D handle.
- Now that you are attached to both working and back-up lines, you can *sit* on the edge, facing out.
- Use the prerigged etrier (foot ladder) and find a comfortable foot loop that's within reach.
- Transfer your weight on to your foot and move your body over the edge, balancing on the etrier.
- Get comfortable where you're standing and DRESS YOUR ROPES over the steel edge roller.

  LEAVING YOUR ROPES UNPROTECTED AND SITTING ON THE SYSTEM WILL CONSTITUTE AN AUTOMATIC FAIL.
- Sit back into your harness, when you are satisfied that your position is good, your ropes are properly protected, and that your descender and back up device and placed correctly and useable.
- ONLY once your final check has been confirmed can you remove your initial cowstail connections and descend to the ground.
- When you ascend back up over the edge, do this entire process in reverse.
- When you ascend to the edge from below, it is important that you CHANGE OVER into your descender, before you breach the edge.

- CLIMBING OVER THE EDGE IN YOUR CROLL CONSTITUTES A MAJOR DISCREPANCY.

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PREVENT DAMAGI

YOUR LIFE D

HIERARCHY

01. IDENTIFY
THE HAZARD

IDENTIFY ALL HAZARDS IN THE A

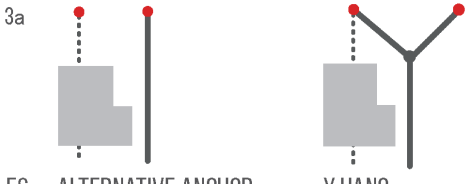
- SHARP
- HOT
- ABRASIVE
- CORROSIV

02. REMOVE
THE HAZARD

EXAMPLES:

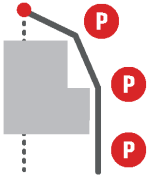
- REMOVE SHARP EDGE
- REMOVE HEAT SOURC
- REMOVE SOURCE OF E

03. AVOID
THE HAZARD



EXAMPLES: ALTERNATIVE ANCHOR Y HANG BARR

04. PROTECT
AGAINST THE HAZARD



- FOR **EDGES**, USE AN APPROPRIATE E
- FOR OTHER **SURFACE HAZARDS**, USI
- EACH ANCHOR LINE SHOULD BE INDI

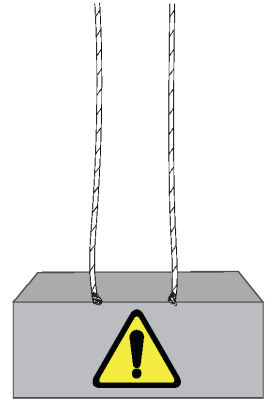
05. VERIFY

- CHECK THE LEVEL OF PROTECTION IS APPROPRIATE AND
- IF NOT, DO NOT PROCEED
- **FOR DETAILED INFORMATION SEE: ICOP 2.7.10, 2.11.3 A**

NOTE: ONLY ONE ANCHOR LINE AND ONE ANCHOR SHOWN FOR CLARITY

KEY: 3a, 3b, SEE ANNEX P, TABLE P.1

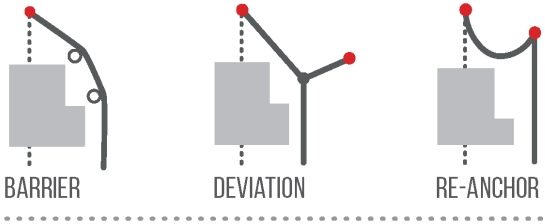
GE TO ANCHOR LINES
E DEPENDS ON IT



HE ANCHOR LINE PATH. EXAMPLES OF HAZARDS:

- TOOLS
- ENTANGLEMENT
- OSIVE
- WIND
- ENTRAPMENT

EDGE
OURCE
OF ENTANGLEMENT



BARRIER DEVIATION RE-ANCHOR

ATE **EDGE PROTECTOR**
S, USE AN APPROPRIATE **ANCHOR LINE PROTECTOR**
E INDEPENDENTLY PROTECTED

P = PROTECT!

AND ROBUST

1.3 AND ANNEX P

"IT IS ESSENTIAL THAT PRECAUTIONS ARE TAKEN TO PREVENT DAMAGE TO ANCHOR LINES"

ICOP 2.11.3.2.1

VERSION 7 - 2 NOVEMBER 2016

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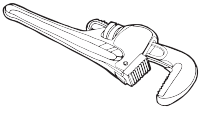
PREVENT DROP

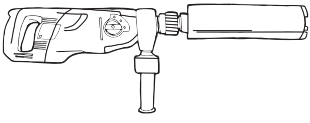
SOMEONE'S LIFE MA

⚠ IDENTIFY THE TOOLS OR OBJECTS THAT CAN B

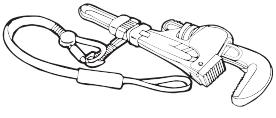
HIERARCHY

01. IDENTIFY & ELIMINATE (WHERE POSSIBLE)

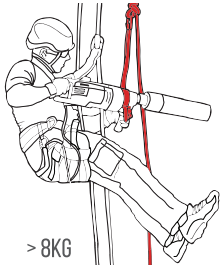




02. PRIMARY CONTROLS (ENGINEERED)



< 8KG



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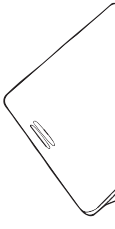
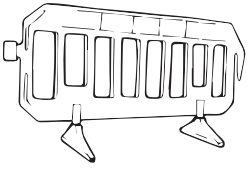
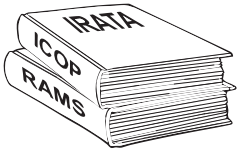


03. ADDITIONAL CONTROLS (ADMINISTRATIVE)





04. PERSONAL PROTECTIVE EQUIPMENT (PPE)

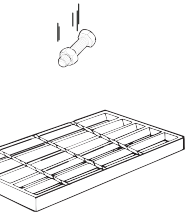
- CHECK IF THE LEVEL OF PROTECTION IS APPROPI
- FOR DETAILED INFORMATION SEE ICOP:
  - 1.4.2.6 AND 2.11.8, EXCLUSION ZONES
  - 2.2.3, PRE-WORK ANALYSIS
  - 2.2.4 AND ANNEX A, RISK ASSESSMENT

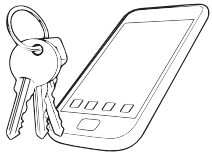
ICOP ANNEX M 1.3 'WHERE TOOLS AND EQUIPMENT ARE CARRIED BY THE ROPE ACCESS TECHNICIAN, APPROPRIATE STEPS SHOUL

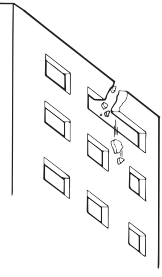
PPED OBJECTS

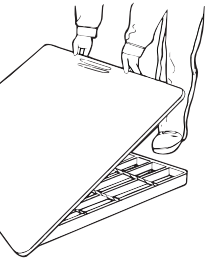
MAY DEPEND ON IT

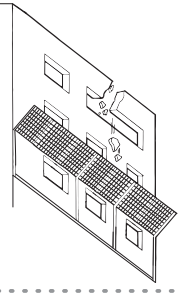
AN BE DROPPED OR CAN FALL











PPROPRIATE AND ROBUST. IF NOT, DO NOT PROCEED.

- 2.2.5 AND ANNEX B, SAFETY METHOD STATEMENTS
- ANNEX M, USE OF TOOLS AND OTHER WORK EQUIPMENT

SHOULD BE TAKEN TO PREVENT THEM BEING DROPPED OR FALLING ON TO PEOPLE BELOW'

CHAPTER 6
CLIMBING

Photo Credit: Pacific Ropes
Bloedel Conservatory, Vancouver, BC

Climbing

Climbing techniques are an extremely valuable skill to learn if you want to become a good rope tech! There are various climbing techniques that exist for gaining progression on a structure using personal fall protection equipment. As a level 1 rope access technician you will expected to demonstrate 2 of them:

Horizontal Aid climbing — While suspended by work positioning lanyards on fixed anchors and mobile anchors (slings or strops).

Fall Arrest Climbing — Using energy-absorbing lanyards or on a pre-installed fall arrest system.

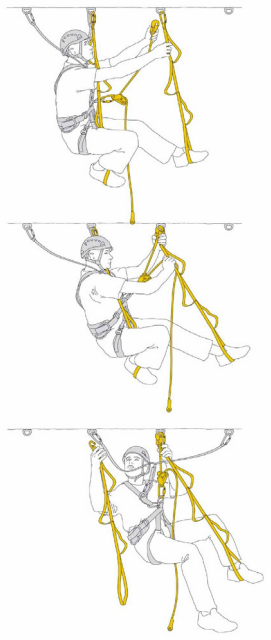
Note: 'Aid' climbing used to be an IRATA only requirement,
but SPRAT has recently added this skill to their level 1 curriculum so EVERYONE will be climbing like beasts all week!!

AID CLIMBING

In demonstrating this technique you will be using your Grillon and your device lanyards (cowstails) to attach yourself to a structure where there will be either permanently installed anchor points, temporary installed anchor points or anchor slings/strops which you would install yourself. This allows us to move in any direction either in suspension or by using the structure/ footloops for support.

When aid climbing, it is imperative that you maintain a minimum of 2 independent points of attachment at all times. Be mindful that 2 lanyards on 1 anchor point is only 1 point of attachment!!

Remember! A third sling is required to bypass an obstacle on the structure when doing mobile aid and you will also need an extra footloop.



PETZL

We can use fall arrest lanyards when it is practical for the worker to support himself or herself on the structure through physical contact (hands and feet). In addition to the worker being self-supported on the structure, they must have back up system in place, which will be attached via a full body harness to either the sternal (chest) or dorsal (upper back) attachment point (check your local legislation). This is important so that in the event of a fall the worker is held in an upright position. NOTE: in Canada fall arrest lanyards MUST be connected to your dorsal attachment.

Technician is tower climbing primarily using his hands and feet, the back up in place is the twin legged fall arrest lanyards, which are connected to his chest attachment point on the harness.

Fall arrest lanyards comprised of connectors, lanyards, and an energy absorber are a common equipment choice when it is necessary to access a structure at height. The total length of the completed ensemble must not exceed 1.83 m from connector to connector. They can either be a single leg lanyard assembly or a twin leg or 'Y' shaped design.

Twin leg lanyards allow the technician to move around a structure by alternately attaching one leg of the lanyard at a time, thus ensuring that there is at least one point of attachment at all times.

The reason we incorporate an energy absorber in to lanyard ensemble is to ensure that any impact experienced by the user in a fall is limited to an acceptable level.

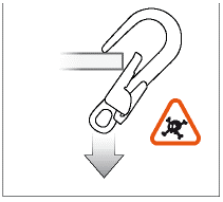
This varies from 4KN to 8KN, depending on the region. For example: in the European Union it is currently 6KN, in Canada it varies between 4KN and 6KN provincially, while in the USA, it is generally 8KN, according to OSHA.

By integrating an energy absorber in to the system, we keep can keep the impact loads below these maximums.

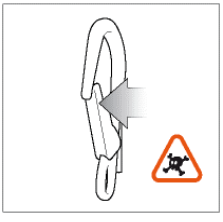
Fall arrest lanyards will have a minimum static strength requirement in accordance with local legislation. In Europe, lanyards made from man-made fibers will be 22KN and in Canada and USA 5000lbs.

As with all connectors, the MGOs are made to be loaded on their major axis and are weaker when poorly positioned.

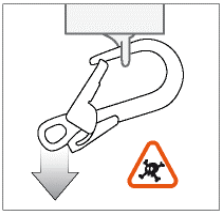
Here are some common examples of incorrect positioning:



Open gate loading:
- Risk of the MGO disconnecting



Lateral pressure on the gate:
- The resistance to lateral pressure on the gate is greater than 1 kN for the CE versions and greater than 16 kN for the ANSI versions.



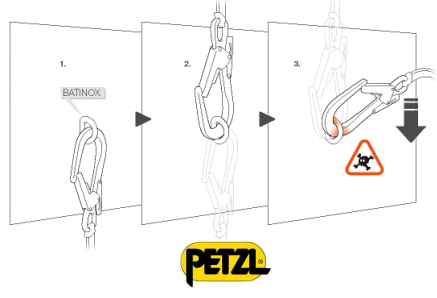
Attachment to an anchor that is too small:
- The length of the MGO can create a significant cantilever load with a risk of breaking the MGO or loosening the anchor.

Frontal pressure on the gate:
- The resistance to frontal pressure on the gate is greater than 1 kN for the CE versions and greater than 16 kN for the ANSI versions.

Risks of rubbing on the gate and the release lever:
- Risk of the gate opening and of the MGO disconnecting.

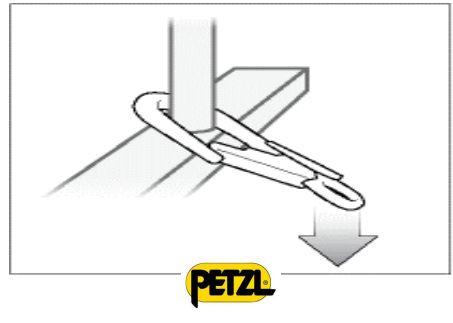
MEDIUM WIDTH BAT'INOX-TYPE-ANCHORS:

This type of anchor almost allows the MGO 60 to move freely, but is tight enough to create a cantilever load in certain cases (e.g. if the user climbs above the anchor and falls).



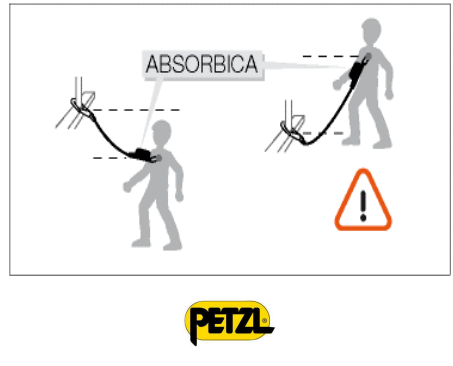
Cantilever load over an edge:

- In a work situation, attaching an MGO to an upright is a common necessity. This can create a cantilever load over an edge.



In this position, the MGO must be used with precautions:

- Beware of the user's position relative to the anchor
- With a Y-lanyard be sure to connect both MGO to the anchor.



Pacific Ropes™

ACCESS THROUGH INNOVATION

Photo Credit: Timothy Zagiel
Hydro Site, Whistler, BC

CHAPTER 7
RESCUE

That's right, you guys have to understand and carry out a safe execution of a co-worker suspended in their descending equipment, by means of a 'pick-off' rescue and from operating a 'pre-rigged' rescue system.

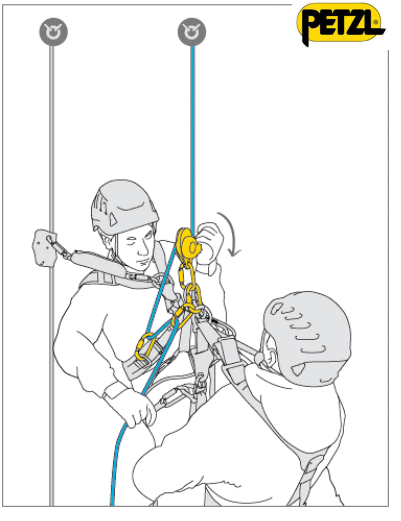
The likelihood of you, as a level 1 technician having to perform a rescue is very remote. However, we were also told that the Titanic would never sink!! So, it's important that we get this dialed in good.

There are some subtle differences with the pick off rescue of a co-worker under IRATA and SPRAT. The rescue can be performed one of two ways, from either the same set of ropes which victim is on or from a completely separate set of ropes.

IRATA will always be from separate ropes, SPRAT can be from either the same or separate ropes.

If, despite all precautions taken, an exceptional and unforeseen emergency requires you to perform an accompanied descent on your I'D S with a 200 - 250 kg load:

- Improve braking control by using a second braking carabiner on the side attachment point of your harness.
- Descend at a very low speed, even if you think you have control of the descent. Beware of overconfidence! Any uncontrolled acceleration will exceed the braking capability of the I'D and expert reflexes will be required to regain control.

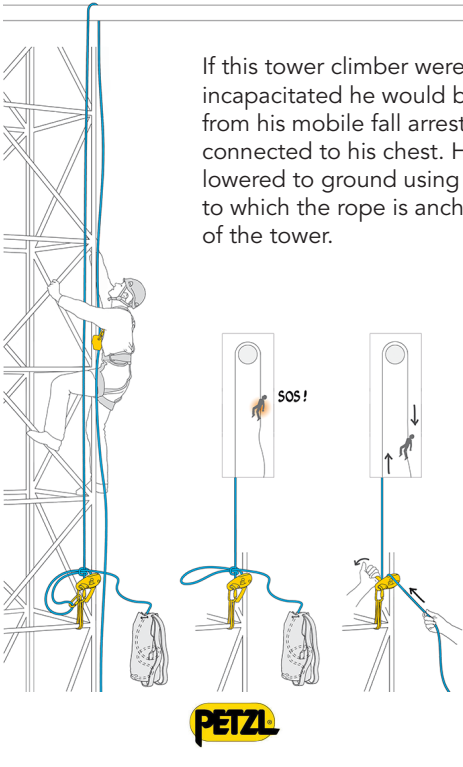


It is very important that throughout this rescue process you maintain two points of connection for the person being rescued, as you will be removing their equipment from the ropes. So, just remember, we always add something before we remove something!!

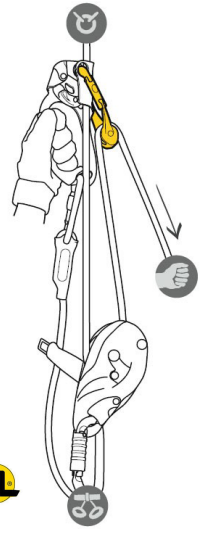
Exceptional situation: This has been mentioned before in the manual. What do we need to do with all the equipment involved in an exceptional situation, like a dynamic fall or rescue? Hint: Check back to the PPE inspection requirements section!!

Answer:

As level 1 rope access technician you must be able to operate a 'pre-rigged' lowering system or what's also known as a 'rigged to rescue system'. You will also need to show an awareness and understanding on how to convert that lowering system in to a simple hauling or lifting system.



If this tower climber were to become incapacitated he would be left hanging from his mobile fall arrest device connected to his chest. He could then be lowered to ground using the belay device to which the rope is anchored at the base of the tower.



If we add a rope clamp and a pulley to the system we now have a simple hauling system that gives us a mechanical advantage of a 3:1 ratio.

Pacific Ropes™

ACCESS THROUGH INNOVATION

Photo Credit: Timothy Zagiel
Canada Place, Vancouver, BC

CHAPTER 8
KNOTS

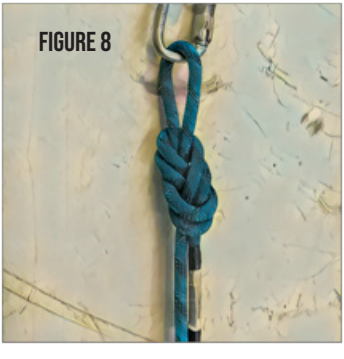
You wanna be a good rope tech, you need to be able to tie knots, go figure!

There has been a vast amount of knots conjured up over the years. From the basics of tying your shoelaces to complex mountaineering knots. Back in the day, even pirates had knots for tying someone up to walk the plank!! The art of knot tying has been around for a long time.

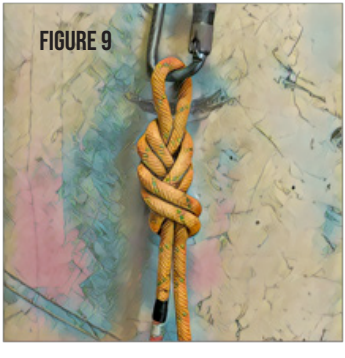
Typically, we use knots to create terminations points in our ropes to then connect to anchor points. You will be glad to hear that, as a level 1 rope tech, you only need to learn a select few. It is also important to mention here that every time we tie a knot, we are weakening the overall strength of the rope. Therefore, it is important that we "dress" the knot correctly!

There are many different ways to tie all these knots. During the week, your instructor will show you a few variations of each one and you'll get plenty of time to practice!!

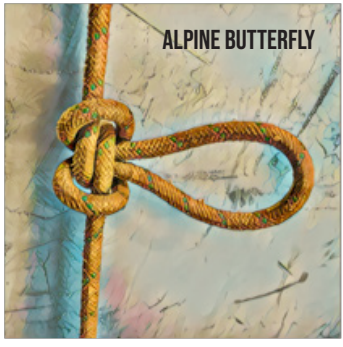
The amount of reduction in the strength of the rope varies. Factors include the type of knot and the accuracy and neatness with which it is tied. Neatening a knot, e.g. making sure the ropes in the knot are parallel and tightened equally, is known as "dressing." Typical strength losses, showing the lower and upper values between a well-dressed knot and a poorly-dressed knot, are listed under each photo.



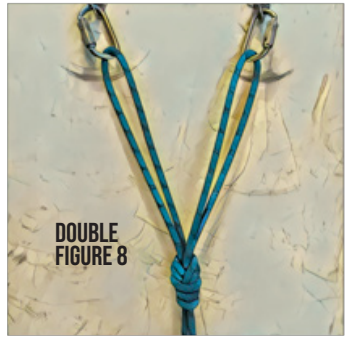
Anchoring knot, easy to re-thread if required. Strength reduction: 23%-34%



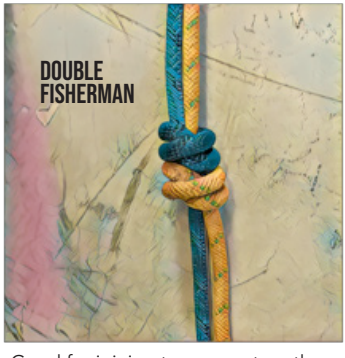
Anchoring knot, easier to untie than an Figure 8. Strength reduction: 16%-32%



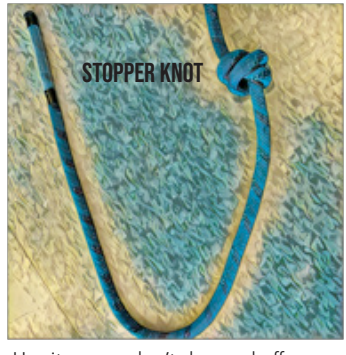
Three directional knot. Strength reduction: 28%-39%



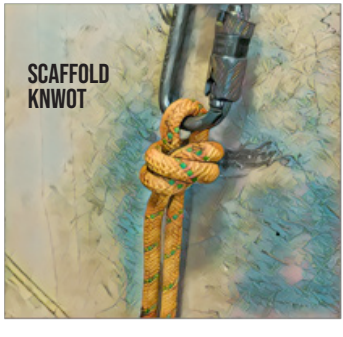
Load sharing, building a Y - hang. Strength reduction: 23%-39%



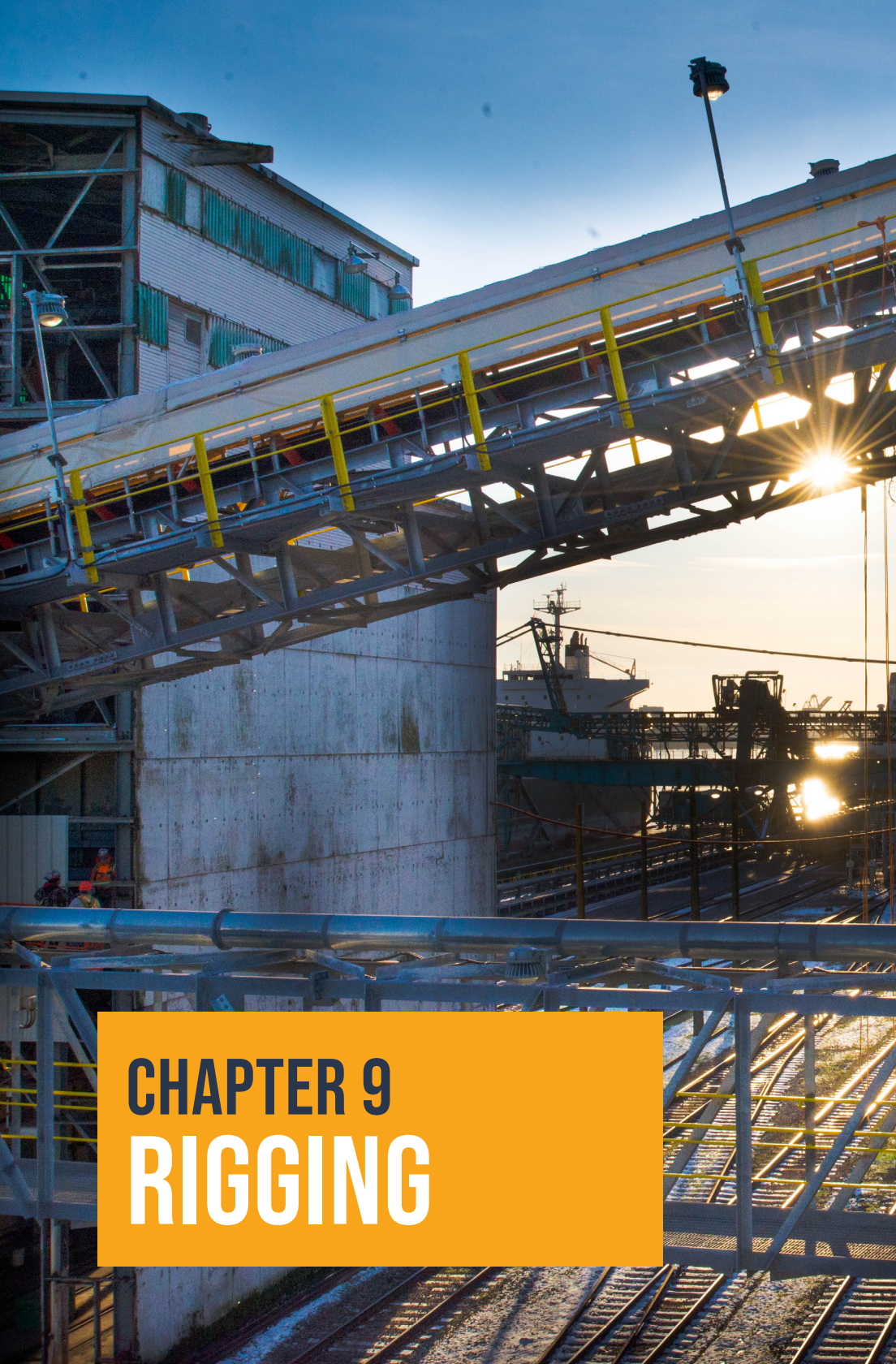
Good for joining two ropes together.



Use it so you don't descend off your ropes!



Very absorbent and compact, difficult to untie. Strength reduction: 23%-33%



CHAPTER 9
RIGGING

Pacific Ropes™

ACCESS THROUGH INNOVATION

Photo Credit: Bodhi Somersun
Bulk Terminal, N. Vancouver, BC

Part of the level 1 syllabus is being competent at demonstrating some basic rigging skills and showing an understanding and some knowledge of the theory behind it.

So, what do we need to rig a safe system of work? Well, we need some anchorage points, anchor devices, anchor points, anchor lines…….

LET'S BREAK THIS DOWN A LITTLE!

ANCHORAGE — A structural or natural feature that provides an anchorage point.

ANCHORAGE POINT — A particular place on an anchorage used for the attachment of an anchor device.

ANCHOR DEVICE — Personal fall protection equipment comprising an assembly with one or more anchor points or mobile anchor points and which is removable from the structure or natural feature.

ANCHOR POINT — Point on an anchor device or structural anchor used for the connection of personal fall protection equipment.

ANCHOR LINE — Flexible line connected to a reliable anchor to provide a means of support, restraint or other safeguard for a person wearing an appropriate harness in combination with other devices.

ANCHOR LINE DEVICE — A collective term for ascending device, descending device and back-up device.

Once we have identified our 'anchorage' and our 'anchorage point' we must be confident that these are suitable. For example, it's probably not a great idea to be rigging off of an old shopping trolley!!

The strength of the anchorage must be at least as strong as the anchor lines (ropes) connected to them.

Can you remember what the minimum static strength requirement is for our ropes? Hint: Check back to the equipment section!

Answer:

To determine the minimum anchor strength, the IRATA ICOP (2.11.2.6) uses a safety factor of 2.5. The maximum impact load on the user in the event of a fall should not exceed 6KN; therefore, as a general rule, the static strength of anchors should be at least 15KN.

Determining the minimum anchor strength for SPRAT, uses a safety factor of 2. The maximum impact load on the user in the event of a fall still should not exceed 6KN; therefore, SPRAT tells us our minimum anchor requirement is 12kN, (or twice the maximum anticipated load).

*Always go by the highest standard you're working under; the above values are often contradicted by your local provincial or state legislation.

It is preferable to have each anchor line attached to own separate anchor; however, a single element of a structure (structural steel) or a natural geological feature (tree) may have adequate strength to serve as both the working line anchor and the safety line anchor. A competent person will determine this but it is basically something we would consider to be of unquestionable strength e.g. the structural steel framework of an Oil rig or a 2m diameter golden Oak.

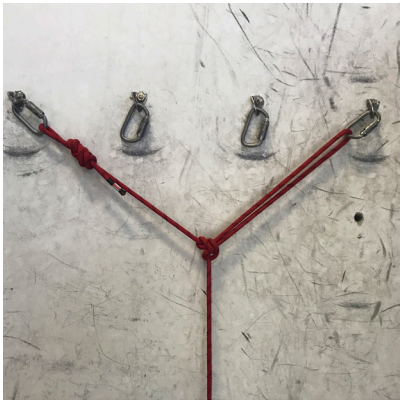
Whether our anchor lines are connected to the same or separate anchor points, we should always aim to distribute the load (you or I) evenly across the anchorage.

Load sharing

To achieve load sharing in a basic anchor system, where both anchor lines are attached to a single structure (steel or a tree) we would attach our anchor devices, usually slings/strops made from wire or textile, to the anchorage point. We then need to connect the termination points (knots) of both our anchor lines (ropes) to the anchor points (carabiners). In other words, put both knots through both carabiners!!!

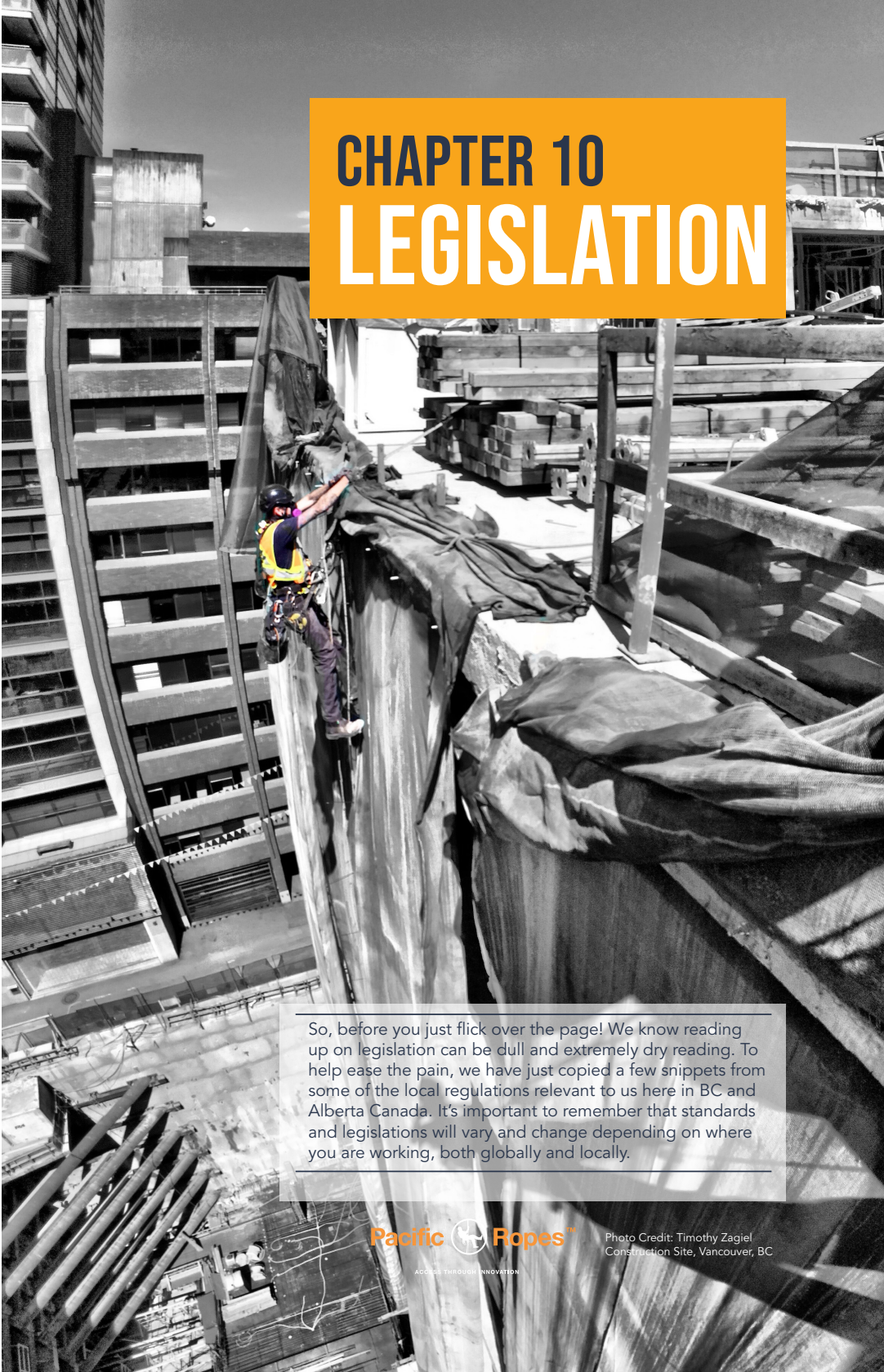
When we don't have a single structure of "unquestionable strength" or when the minimum recommended static strength of 15KN for a single anchor is not achievable, we may have to utilize two, or more, separate anchorage points which could be any distance apart and at different heights. We can then create what is known as a Y-Hang using a variety of knots to evenly load share our anchors.

The preferred angle in a Y hang is anything less than 90°. At this angle, we'd have approximately 70% of the supported load on each anchor point.



The critical angle in a Y hang is 120°. At this angle, we'd have approximately 100% of the supported load on each anchor point.

CHAPTER 10
LEGISLATION



So, before you just flick over the page! We know reading up on legislation can be dull and extremely dry reading. To help ease the pain, we have just copied a few snippets from some of the local regulations relevant to us here in BC and Alberta Canada. It's important to remember that standards and legislations will vary and change depending on where you are working, both globally and locally.

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ACCESS THROUGH INNOVATION

Photo Credit: Timothy Zagiel
Construction Site, Vancouver, BC

34.3 - ROPE ACCESS PLAN

(1) Before a rope access system is installed or used in a workplace, a written Rope Access plan must be prepared and be available at the workplace.

34.4 - TRAINING & CERTIFICATION

(1) Before allowing a person to perform rope access, the employer must ensure and document that the person:

- (a) has received training in the safe use of a rope access system, including, as appropriate to the work being done, the safe work practices, skills and practical experience hours described in one of the following groups of publications:
- (i) International Code of Practice (2013) and General requirements for certification of personnel engaged in industrial rope access methods, Edition 6 (June 2009), published by the International Rope Access Trade Association;
- (ii) Safe Practices for Rope Access Work (August 2012) and Certification Requirements for Rope Access Work (November 2012), published by the Society of Professional Rope Access Technicians;

34.7 - PERSONAL LOG

(1) A person who performs Rope Access must maintain a personal log containing a record of the Rope Access performed by the person.

This is not the complete regulation. Please take the time to read all of Part 34 and Part 11 before embarking on your work at height career!

11.2 - OBLIGATION TO USE FALL PROTECTION

(1) Unless elsewhere provided for in this Regulation, an employer must ensure that a fall protection system is used when work is being done at a place

- (a) from which a fall of 3 m (10 ft) or more may occur, or
- (b) where a fall from a height of less than 3 m involves a risk of injury greater than the risk of injury from the impact on a flat surface.

11.3 - FALL PROTECTION PLAN

(1) The employer must have a written fall protection plan for a workplace if (a) work is being done at a location where workers are not protected by permanent guardrails, and from which a fall of 7.5 m (25 ft) or more may occur.

11.6 - ANCHORS

(1) In a temporary fall restraint system, an anchor for a personal fall protection system must have an ultimate load capacity in any direction in which a load may be applied of at least:

- (a) 3.5 kN (800 lbs), or
- (b) four times the weight of the worker to be connected to the system.

(2) Each personal fall protection system that is connected to an anchor must be secured to an independent attachment point.
(3) In a temporary fall arrest system, an anchor for a personal fall protection system must have an ultimate load capacity in any direction required to resist a fall of at least:

- (a) 22 kN (5 000 lbs), or
- (b) two times the maximum arrest force.

(4) A permanent anchor for a personal fall protection system must have an ultimate load capacity in any direction required to resist a fall of at least 22 kN (5 000 lbs).

SECTION 808 - ROPE ACCESS PLAN

An employer must develop an occupational rope access safe work plan for a work site if:

- a worker at the work site may fall 3 meters or more, or
- there is an unusual possibility of injury if a worker falls less than 3 meters.

SECTION 826 - WORKER COMPETENCY

Safe and competent rope access workers require a combination of both training and practical experience hours. Competent workers must be adequately qualified, suitably trained, and have sufficient experience to perform their work safely. Working a minimum number of hours at height helps ensure that workers meet the third component – sufficient experience – of the competency requirement. Documenting those hours in a logbook (see section 827) provides a record to employers of the practical experience hours a worker has gained while working at height.

SECTION 827 - WORKER'S PERSONAL LOGBOOK

Worker logbooks are a mandatory requirement of industrial rope access workers. The logbook concept is an essential component of modern industrial rope access. A worker's logbook should be considered a tool that an employer or prospective employer can use to verify and quantify the work history of the rope access worker. The logbook should clearly indicate the duration and nature of the work performed as well as the access techniques employed by the worker. Given the freelance nature of rope access workers, the logbook accompanies the worker and details the breadth and experience of the worker.

This is not the complete regulation. Please take the time to read all of Part 41 and Part 9 before embarking on your work at height career!

SECTION 139 - GENERAL PROTECTION

At fall heights of 3 meters or more, at lesser heights if there is an unusual possibility of injury, or if the fall is through an opening in a work surface, subsection 139(1) requires that workers be protected from falling, regardless of whether the work area is a temporary or permanent work area.

SECTION 140 - FALL PROTECTION PLAN

A fall protection plan is required if work is performed at a work site at which a fall of 3 meters or more may occur and guardrails do not protect workers. Section 8 of the OHS Regulation requires that the plan be in writing and available to workers. The plan must be available at the work site before work with a risk of falling begins.

11.6 - ANCHORS

Anchors used for attachment of a personal fall arrest system must have a minimum breaking strength of

- at least 16 kN (3600 lbs) per worker attached, in any direction required to resist a fall, or
- two times the maximum arresting force per worker attached, in any direction required to resist a fall.

The anchor to which a personal fall arrest system is attached must not be the same anchor that supports or suspends a platform. Independent anchors are required so that if the anchor supporting or suspending the platform fails, then the worker does not fall along with the platform.
Temporary fall arrest anchors such as wire rope slings, synthetic webbing slings, I-beams sliders, I-beam clamps, etc. must have a minimum breaking strength of:

- at least 16 kN (3600 lbs) per worker attached, in any direction required to resist a fall, or
- two times the maximum arresting(a) 22 kN (5 000 lbs), or
- two times the maximum arrest force.