

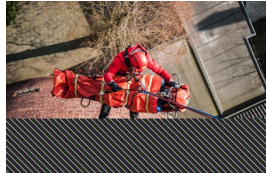
# Rope Access Training manual ENG

Document No: HSE 2016 - 037

Revision	Date	Description	Auteur	Checked / approval
V03	11-01-2021	Update on 6.11 Edge management	E. Birkhoff	W. de Boer
V02	06-03-2018	1.1.1 Article 7.23c; 5.8 Lifespan; 6.2 Harnas; 6.3 Descending equipment; 6.4 Back-up equipment; 11 Fall Factor; 11.1 Free Space; 3.2 ABC Protocol	F. Joosten	W. de Boer
V01	29-05-2016	Issued for approval	F. Joosten	W. de Boer
	12-05-2016	Revision draft	F. Joosten	W. de Boer
	28-04-2016	Draft	F. Joosten	W. de Boer

Copyright © Height Safety Expert.  
Copying, partly copying, other usage without written permission prohibited.

# Rope Access Training Manual



Copyright © Height Safety Expert.  
Copying, partly copying, other usage without written permission prohibited.

## House rules

### **Registration**

Make sure you are registered before the start of the lesson. Lesson normally starts at 08.30 hours, unless stated differently.

### **Smoking**

Smoking is only allowed outside, out of sight of the children.

### **Alcohol / drugs**

Alcohol / drugs are not allowed during the lesson, work, break time etc.

### **Accidents**

Make sure that each (near) accident is reported and registered.

### **Medical statement**

Please complete medical statement before start of training course/lesson.

### **First Aid**

First Aid at designated location.

### **Fire alarm**

In case the fire alarm sounds, take the shortest route to go outside, do not take any personal belongings with you and assemble at the designated place.

### **Emergency exit**

Emergency exit will be appointed by the instructor. Please remember this!

### **Parking**

Parking at the carpool area.

### **Mobile telephone**

Switch mobile phone off or put on mute. "Secure" mobile phone when Working at Heights activities.

### **Safety during the training course**

Prior to the training course a safety briefing will take place.

## Foreword

The objective of the manual “Rope Access Training Manual” is to provide you as participant, not just the Rope Access training course but also information regarding:

- Techniques;
- Procedures;
- Responsibilities etc., which:
  
- Are based on Irata International Code of Practice  
Irata, Industrial Rope Access Trade Association

Irata International is recognised as world’s leading authority regarding industrial rope techniques. The advantage of rope techniques lies in the safety and speed whereby rope access operators can perform their work activities.

The primary objective when using rope techniques during work activities are:

Good planning, managing and to perform the work activities with the aim to minimize accidents or even to eliminate these.

By using a code of conduct Irata International ensures for high quality training courses, work procedures and especially many safe working hours with Rope Access techniques.

Height Safety Expert has issued this manual in the Dutch & English language. The Dutch version is leading.

# Contents

<b>1 Legislation</b>	<b>8</b>
1.1 European/Dutch legislation	8
1.1.1 Article 7.23c	8
1.2 Employment hygiene strategy	8
1.3 English legislation	9
1.3.1 Working at Heights Regulations 2005	9
1.3.2 Lifting Operations and Lifting Equipment Regulations 1998	9
1.3.3 Personal Protective Equipment at Work Regulations 1992	9
1.3.4 Provision and Use of Work Equipment Regulations 1998	10
1.3.5 Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995	10
1.3.6 Control of Substances Hazardous to Health 2002	10
<b>2 Risk assessment</b>	<b>11</b>
2.1 5 Steps of Risk assessment	11
<b>3 Medical Working at Heights</b>	<b>12</b>
3.1 Harness Suspension Trauma (HST)	12
3.2 ABC Protocol	13
	14
<b>4 Training &amp; Certification scheme</b>	<b>15</b>
<b>5 Rope Access material</b>	<b>21</b>
5.1 PPE	21
5.2 EN standards	21
5.3 CE marking	22
5.4 Material selection	22
5.5 Material traceability	23
5.6 Maintenance	23
5.7 Storage	23
5.8 Life span	24
5.9 Strengths	25
5.10 Inspection	25
<b>6 Personal Protection Equipment</b>	<b>26</b>
6.1 Helmets	26
6.2 Harness	26
6.3 Descending equipment	27
6.4 Back-up equipment	27
6.5 Ascension/jumar	28
6.6 Line	28
6.7 Connectors	29
6.8 Open Sling	30
6.9 Wire strop	30
6.10 Etriers	30

6.11 Edge protection (edge management)	31
6.11.1 Hierarchy of rope protection	31
6.11.2 Types of rope protection	33
6.12 Work seat	35
6.13 Pulleys	35
6.14 Work Restrain	35
6.15 Fall protection	36
<b>7 Standards work equipment</b>	<b>37</b>
7.3 General standards	39
7.4 Rescue standards	39
7.5 UIAA Standards	39
<b>8 Knots</b>	<b>40</b>
8.1 Double eight knot	40
8.2 Bunny ears	40
8.3 Double fisherman's knot	41
8.4 Bowline	41
8.5 Barrel knot	42
8.6 Butterfly knot	42
8.7 Overhand knot	43
<b>9 Anchor systems</b>	<b>44</b>
9.1 Basic rigging	44
9.2 Y-Hang	45
9.3 Angles and forces (anchor point))	47
9.4 Re-Anchors	48
9.5 Deviation	49
9.6 Angles & strengths (deviation point)	50
9.7 Pull-through	51
9.8 Work restrain / Life line	52
9.9 High lines	53
<b>10 Rigging to rescue</b>	<b>55</b>
<b>11 Fall factor</b>	<b>56</b>
11.1 Free space	58
<b>12 Hauling systems</b>	<b>59</b>
<b>13 Rope Access techniques</b>	<b>62</b>
13.1 Introduction PPE	62
13.2 Ascending croll combined with asap	63
13.3 Descending croll combined with asap	63
13.4 Ascending l'd combined with asap	64
13.5 Descending l'd combined with asap	64
13.6 Basic position	65
13.7 Short rope exchange	65

13.7.1 Ascending	65
13.7.2 Descending	66
13.8 Long rope exchange	66
13.9 Rebelay < 1.5 metres	67
13.10 Rebelay > 1.5 metres	67
13.11 Passing knot	67
13.11.1 Safety line	68
13.11.2 Work line	68
13.12 Aid Climb	68
13.12.1 horizontal	68
13.12.2 Vertical	69
13.13 Deviation	69
13.14 Over the edge	69
13.15 Pull through	70
13.16 Passing mid rope protection	70
<b>14 Rescues</b>	<b>71</b>
14.1.1 Rescue taking over descending equipment from above.	71
14.1.2 Rescue taking over descending equipment from below.	72
14.2 Rescue from croll	73
14.3 Rescue from deviation	73
14.4 Passing knot with casualty	74
14.5 Rescue from aid climb	74
14.6 Rescue from short link	75
14.7 Rescue from rebelay	75
14.8 Rescue cross haul	76
14.9 Break into tight line	77
<b>15 Climbing techniques</b>	<b>78</b>
15.1 Fall protection	78
<b>16 Definitions</b>	<b>79</b>
<b>17 Abbreviations</b>	<b>83</b>
<b>18 References</b>	<b>83</b>

# 1 Legislation

## *1.1 European/Dutch legislation*

Fall protection should be applied above:

- 2.5 metres;
- And in case of risk of falling.

### **1.1.1 Article 7.23c**

Article 7.23c Specific provisions concerning the use of access and positioning techniques with lines.

## *1.2 Employment hygiene strategy*

- Approach source  
Avoid working at heights work activities if possible.
- Keep distance  
Keep distance from the real risk of falling.
- Collective provisions  
Work platform, scaffolding, safety nets, cage ladder, fence work.
- Personal Protection Equipment  
Work restraint  
Work place positioning  
Fall protection



## **1.3 English legislation**

### **1.3.1 Working at Heights Regulations 2005**

WAHR

No minimum height is set for working at heights work activities. For all work activities it applies that if there is a risk of falling and injury can be caused, regardless the work activities/duration, precautions should be taken. Please keep in mind that Collective measures prevail Personal Protection Equipment. This applies for moving to the work place and back.

### **1.3.2 Lifting Operations and Lifting Equipment Regulations 1998**

LOLER

3 objectives of LOLER:

- Lifting Operations are carefully planned and managed.
- Lifting equipment is used in a safe manner.
- Lifting equipment is inspected by a competent person.

3 types of inspection:

- Before/during/after use;
- Interim inspection;
- Every 6 months.

LOLER is applicable when a load is moved up/down.

Hereby is an important part that one or more people are also considered as load.

### **1.3.3 Personal Protective Equipment at Work Regulations 1992**

As well as the Dutch legislation the employee will be:

- Provided with materials and equipment
  - Materials: inspected, maintained etc.
- Follow training courses
- Avoid and report unsafe situation. (Remember defect materials)

### **1.3.4 Provision and Use of Work Equipment Regulations 1998**

#### **PUWER**

All materials and equipment used by the employee will be provided by the employer and will be:

- Suitable for the work activities;
- Maintained, safe to use;
- Inspected, safe to use.

### **1.3.5 Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995**

Reporting of deathly or sever injury:

- More than 7 days;
- Work related injury;
- A dangerous occurrence.

### **1.3.6 Control of Substances Hazardous to Health 2002**

Contains 8 steps:

- Which dangerous substances are use at the work place and describe what these substances do with the health;
- Decide which precautions should be taken before the start of the work activities;
- Avoid contact with dangerous substances if possible, check exposure;
- Ensure that precautions/safety regulations are complied with;
- If necessary, monitor exposure of the employee;
- Ensure for medical check-up when the regulations prescribe this;
- Where necessary, use procedures for dealing with accidents and emergency situations;
- Ensure that the employees are well informed/trained/supervised.

## 2 Risk assessment

A risk assessment is a system that gives a review of risks that can occur at the work place and can cause injury to people or materials.

These are essential for a safe work place and should be read and understood by the employees.

Together with the work instruction the risk assessment will ensure for a safe way of working.

Always remember a rescue provision.

Effect = Chance x Consequence

### ***2.1 5 Steps of Risk assessment***

1. Identify the danger
2. Describe who is at risk and how
3. Evaluate the risks and describe the precautions
4. Describe your findings and implement these
5. If necessary, improve your risk assessment

# 3 Medical Working at Heights

## 3.1 Harness Suspension Trauma (HST)

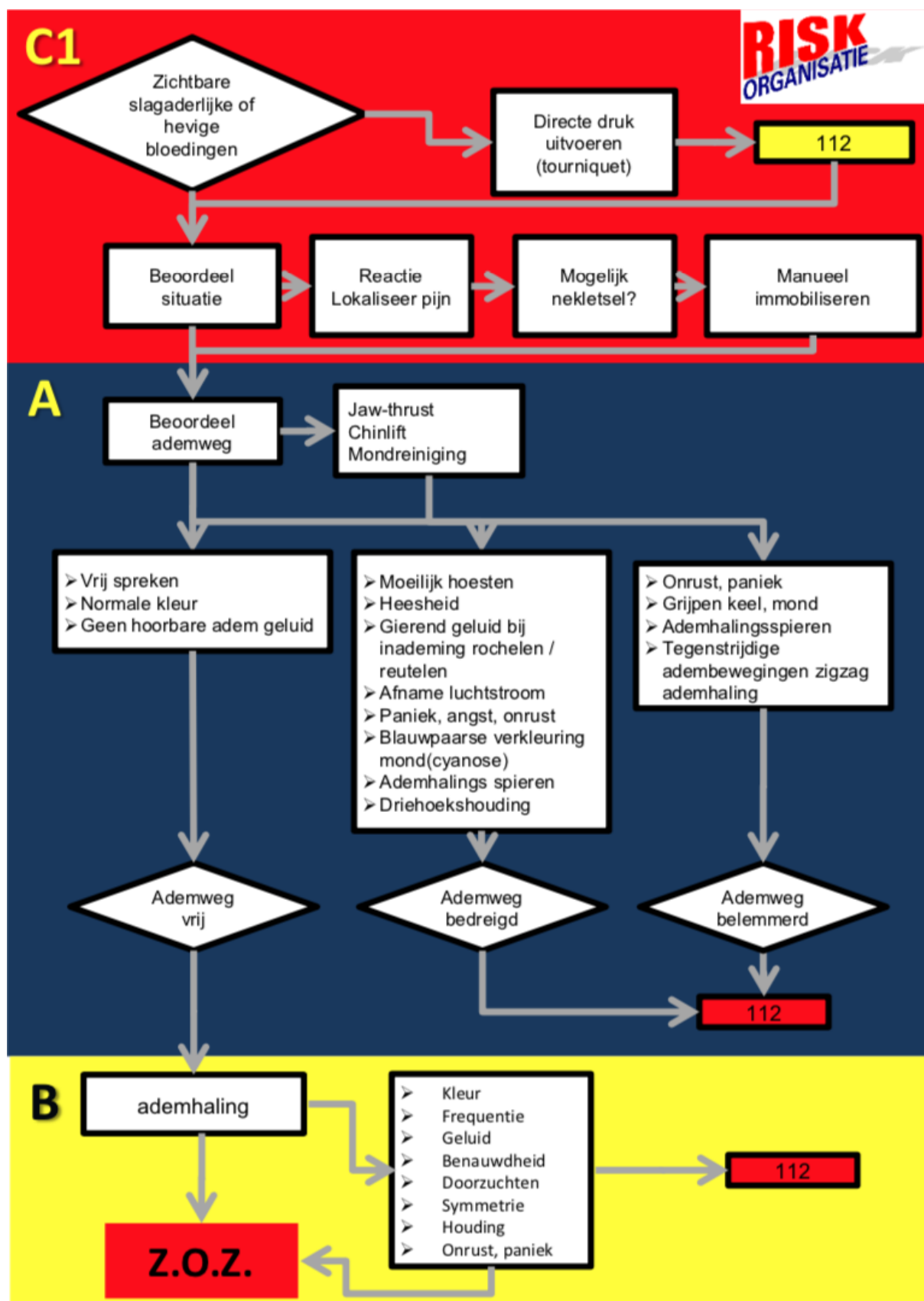
Harness Suspension Trauma is caused by a person who is hanging motionless in his harness after a fall. This can be fatal after approximately 15 minutes.

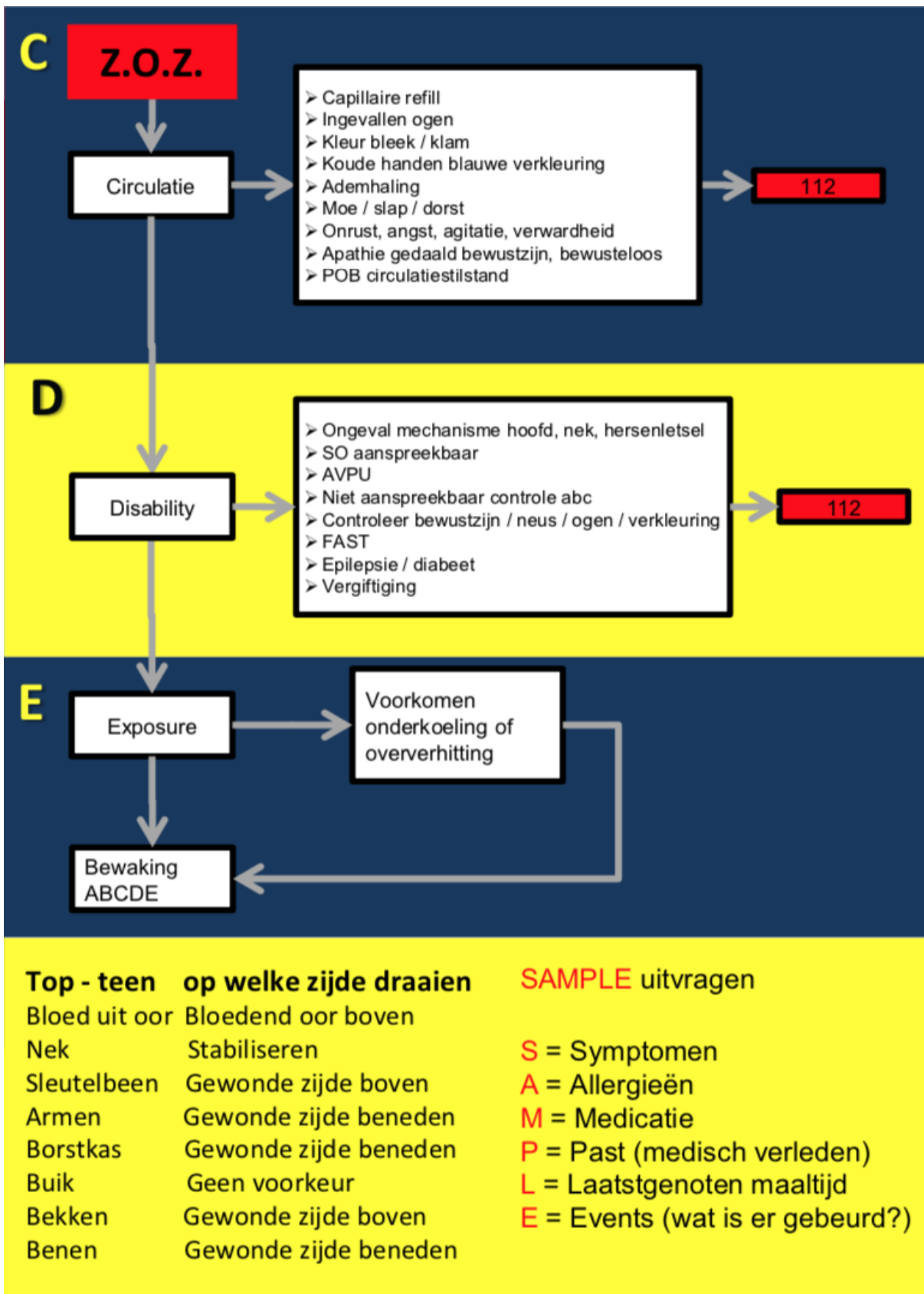
Consequence: accumulating of blood, no oxygen distribution. This leads to various severe diseases that can cause death.

Rescue and treatment:

- Reassure the casualty
- If possible, make casualty move legs/toes
- Apply basic principles trauma management (Airway, Breathing, Circulation)
- Recue downwards, if possible
- A fully conscious casualty may laid down
- A semi-conscious/unconscious casualty put in recovery position (open airway)
- Always go to the hospital for a check-up

### 3.2 ABC Protocol





# 4 Training & Certification scheme

## 4.1 Level of rope access qualifications

All rope access and all related trainings are carried out by personnel who are competent and appropriately supervised. The training supervisor has an IRATA L3 certificate with instructor status or is holder of a L3 certificate for more than a year. The instructor (L3) must have a valid first aid course and appropriate first aid equipment must be on site all time. IRATA trainees shall be trained guiding the latest TACS document scheme. Technicians who have not worked for more than 6 months under supervision of a L3 on ropes shall have a refreshment course of at least 1 day. Record of this training and other relevant training shall be updated in the IRATA Logbook

The IRATA L1, 2 or 3 training course is in basic planned in 4 training days with a final examination on day 5 by an independent IRATA Assessor.

In the IRATA Schedule there are 3 levels:

- Level I Rope access technician
- Level II Lead rope access technician
- Level III Senior rope access technician or Supervisor

### 4.1.1 Level I – Technician

General Requirements

- Knowledge of equipment strengths and safety factors and the back-up philosophy.
- Edge preparations, anchors, knots and rope protection.
- Care and examination of ropes, harnesses, hardware and other equipment.
- Static / dynamic loads, fall factors and belays.
- Awareness of the other team members working with or in the locality of the trainee.

Ascending / Descending:

- Correct use of ascenders, descender and back-up.
- Simple ascent and descent and obstacle passing.
- Mid-rope transfers from descent to ascent and vice-versa.
- Rope transfer and re-belay techniques.

More Advanced Skills:

- Aiding techniques and traversing.
- Safe use and understanding of aid equipment.
- Basic recovery methods.

After achieving the necessary competence, the Trainee Technician will be required to work through an induction period during which he must be supervised at all times by Experienced L3 Technicians.

To ensure improvement in the Trainee's ability, continuous assessment and instruction should be given by experienced and senior technicians.

#### **4.1.2 Level II - Lead Technician**

Having successfully completed an induction period of at least 1000 logged hours, the Technician may be trained and assessed to IRATA level II. In addition to all the material covered by IRATA level I competence is required in the following aspects.

General:

- Equipment certification
- Health and Safety laws.
- Report writing
- Work site organisation.

Rope Work:

- Rigging of various anchor systems.
- Pitch head, traverse and tramway rescues.

After passing this level the Experienced Technicians will have the knowledge, skills and competence to look after themselves in any rope access situation.

#### **4.1.3 Level III - Supervisor / Senior Technician**

After working at least 1000 logged hours and minimum 1 year as an Experienced Technician (i.e. in addition to the 1000 level I hours) further training and instructions to IRATA level III may be conducted. In addition to all the material covered by IRATA levels I and II the Senior Technician will have to be competent in the following aspects:

- All relevant legislation.
- Equipment and personnel requirements.
- Permit Systems
- HIRA (where applicable)
- Team briefing / organisation
- Complicated rescue procedures
- Client liaison
- Level I



Teams for rope access operations are selected by the Operations Department according to:

- Overall project size and requirements
- Scope of Work
- Work place location (e.g. above water)
- specific operations
- personnel training and competency – access specific
- Personnel training and competency – work scope specific

Minimum team size for any rope access operations is two employees. There is no maximum number of employees although the number of Level III Supervisors must be proportionally increased bearing in mind specific project requirements.

A Level III Supervisor must always form part of the team.

#### **4.1.4 Renewal / refresher / training**

Refresher courses are a requirement for those IRATA rope access personnel who are non-continuous. If an operative has not carried out any rope access work for six months, they will undergo such training. This training may be carried out on site where appropriate. A trainee is in closed supervising and extra monitoring during the training and assessment. The duration of the training depends on the personal skills and or evidence stated in the IRATA Log book and guiding the minimal requirements of the ICOP.

### **4.2 Experience**

Height safety Expert adheres to the IRATA scheme of training as described in the IRATA ICOP for certification of personnel engaged in rope access.

#### **4.2.1 Level of experience**

To ensure understanding of the principles and procedures of rope access techniques Height Safety Expert Recommended rope access may be categorized as follows:

1. Trainee rope access technicians have successfully passed the Level I training course and will be required to work through an induction period. To ensure improvement in the trainee's ability during this period, he must be supervised at all times by experienced rope access technicians under the "buddy system" and be restricted to guard duties, general assistance or easier rope work until the supervisor judges him competent to undertake more extensive duties. An inexperienced team member should not be appointed as the sole stand-by man if, in this role, he may be required to implement a recovery system with which he is not fully conversant. On a 3-man team this permits a maximum of one trainee rope access technician.
2. Experienced technicians have successfully completed an induction period at Level I, or have successfully passed a Level II training course and are considered competent in all rope access situations e.g. capable of rigging ropes and recovery systems, work site organisation, and appropriate legislation.
3. Rope access supervisors have extensive and varied field experience and can be considered competent to look after other team members.

## **4.2.2 Personal Logbook**

To confirm experience and promote progression in qualification, personal log books will be maintained by all rope access technicians. These will be signed by the work site rope access supervisor (IRATA L3) and may be stamped and or signed. Entries in log books that are not countersigned by the team leader will be disregarded. Log books may be used by supervisors to make significant comments on technician's performance.

Failure to present a log book for signature and comment may lead to disciplinary procedures. Level I, II and III technicians should log hours per project spent on rope access activities only. The entries should identify tasks being undertaken. Level 3 supervisors should also log nature of work, Height, customer and team size.

At the first pages of the logbook you can find the personal details, photo and IRATA number of the technician and the followed trainings (skills). The following show the experience of the technician.

The personal Log book will be issued by IRATA office after a successful assessment. If the logbook is full or lost the technician will have to contact the IRATA organisation who can provide a New personal logbook.

## **4.2.3 Competence assessment**

Assessment of competence of rope access technicians will be made by the IRATA assessor after a completed rope access training as listed in the ICOP. The examination is based on the information and manifestation of the given written theoretical part and the practical part. Before the assessment the training company has to be checked the technician logged hours, validation time of the current level and the medical health of the trainee. The level of IRATA qualifications, showed skills and logged relevant work experience form the cornerstones of the assessment.

## **4.2.4 Validity of qualifications**

In principle of the validity of IRATA level certification is 3 years after assessment date.

During a training all qualifications IRATA rope access, first aid, medical certification, company introduction courses etc. must be kept up to date. These will be checked prior to trainees being considered for any training. Copies of these should be available on site and will be held in personnel files at the office in Steenberg. All the information is logged and updated in a CV and Personally control certificate as previewed in annex K.

### **4.3 Rope Access team manning levels**

Manning levels for rope access teams will be determined by Height Safety Experts and subject to risk assessment to ensure autonomous rescue capability for all foreseeable situations.

The following minimum manning levels will be applied:

- For onshore working or topside on straightforward tasks there will be a minimum of 2 technicians. In this situation the team should at least consist of a level III supervisor and a level I.
- For work across water there will be a minimum of 3 technicians, at least 1 level III supervisor.
- Where a rope access team has more than one level III qualified technician, only one of these shall be the appointed supervisor and discharge the supervisor's responsibilities.

## 4.4 Assessment and certification schema



### IRATA ASSESSOR ASSESSMENT CHECKLIST

Assessment date:  
Training centre:

CANDIDATE NAME & LEVEL TO BE ASSESSED	L 1	L 2	L 3					
All required areas are to be assessed and marked in the appropriate box: P = Pass; Dis = Minor Discrepancy; F = Fail. Boxes marked 'A' are awareness only, use under direct supervision. See Technician Assessment and Certification Scheme for detailed marking criteria.								
<b>PLANNING &amp; MANAGEMENT</b>								
Level 1 Questions								
Level 2 Questions								
Level 3 Questions								
Hazard identification and risk assessment	A	A						
Job planning exercise (incl. access & emergency)								
<b>EQUIPMENT</b>								
Selection, care & maintenance of equipment	A	A						
Pre-use checking of equipment								
Assembly of equipment & buddy check								
Inspection of equipment	A	A						
<b>RIGGING Assess all white boxes and a minimum of any 2 grey boxes</b>								
Anchor selection	A	A						
Knots and rope handling								
Basic anchor system								
Y-hangs (L1 small, L2 & L3 wide)								
Hazard avoidance and rope protection								
Re-anchors								
Deviations								
Retrievable rigging								
Work restraint lines								
Vertical fall arrest systems								
Tensioned lines								
<b>RIGGING FOR RESCUE AND HAULING Assess all white boxes and a minimum of any 1 grey box</b>								
Lowering system								
Hauling systems	A							
Cross haul								
Complex rescue system (team rescue)								
<b>ROPE MANOEUVRES Assess all white boxes and a minimum of any 5 grey boxes</b>								
Back-up devices								
Descent								
Ascent								
Changeovers								
Descent using ascending devices								
Ascent using descending device								
Deviations								
Rope-to-rope transfer								
Re-anchors (L1 – small, L2 & 3 – wide)								
Passing mid-rope knots								
Edge obstruction at the top								
Use of work seat (comfort seat)								
Passing mid-rope protection								
<b>CLIMBING TECHNIQUES</b>								
Horizontal aid climbing – fixed anchors								
Horizontal aid climbing – moveable anchors								
Vertical aid climbing								
Climbing with fall arrest equipment								
<b>ROPE RESCUES Assess all white boxes and a minimum of any 2 grey boxes</b>								
Rescue from descent mode								
Rescue from ascent mode								
Passing a single-anchor deviation with a casualty								
Passing a double-anchor deviation with a casualty								
Rope-to-rope transfer with a casualty								
Passing a small re-anchor with a casualty								
Mid-transfer rescue								
Passing mid-rope knots with a casualty								
Use of tensioned ropes for rescue								
<b>CLIMBING RESCUES Assess all white boxes and a minimum of any 1 grey box</b>								
Rescue from aid climb								
Rescue from fall arrest equipment								
Rescue from aid climb – short connection								
<b>ADDITIONAL NOTES MADE DURING THE ASSESSMENT</b>								
NOTE	NOTE	NOTE	NOTE					
NOTE	NOTE	NOTE	NOTE					
NOTE	NOTE	NOTE	NOTE					

Form 060, v 2015-December-01

# 5 Rope Access material

## 5.1 PPE

Personal Protection equipment is divided in 3 categories, including

Category 1:

PPE against low risks. This is equipment that can offer protection without any expertise and tools. When the protection fails through this equipment, slight and superficial injuries can occur. The manufacturer compiles a technical file for each product and saves this for at least 10 years after production date.

Personal protection equipment from risk classification I are, for example, sun glasses, rain coat and simple garden gloves.

Category 2:

PPE against average risks. This is equipment that is not covered by the risk classification I and whereby the manufacturer should ensure that the equipment complies with provisions according the EC-guideline 89/686/EEC. Apart from the technical file (see category I) the manufacturer also provides for a type colour of each product. Most of the personal protection equipment is covered by this category. Examples are safety glasses, lie jackets and safety helmets.

Category 3:

PPE against high risks. This is complex equipment have extra requirements, apart for the stated conditions in classification II, such as the production under a EC recognised quality assurance system.

For example, a harness: a piece of equipment that offers protection against falling of great heights.

## 5.2 EN standards

EN is a standard for which the “material” requires a type approval.

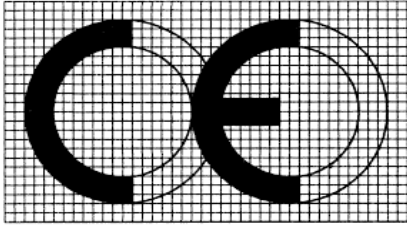
For example:

EN 361	Integral harness
EN 341	Descending equipment
EN 358	Work positioning system
EN 1891	Semi static braided line

In the standard the minimum requirements are described.

### 5.3 CE marking

The CE marking refers to the safety of the product. The CE marking indicated that it complied with the requirements regarding health and safety (Schengen agreement).



The CE is often used in combination with an EC statement for quality/quality assurance system of the end product.

For example:

A Bob the Builder helmet is not suitable for Working at Heights activities but does have a CE marking. This CE marking only indicates that it is suitable as a toy. Think for instance of small parts, sharp edges etc.



### 5.4 Material selection

The selection of the correct material for the order is of essential importance to ensure that the material has optimum effect under the right circumstances and to ensure that the user is best protected

Remember:

- Suitability of the material for the relevant order/environment
- Correct use of the material
- Knowledge of the material to be used
- To make it compatible to already used materials
- Do the materials have the correct EN standards

## **5.5 Material traceability**

The registration gives insight if the PPE is able to assure its function, provision of safety. It is necessary to obtain information from the users. Such as particulars after a fall or chemical contamination.

The registration should be done by as little people as possible. As mutual mistakes could be made (KAM manager/prevention employee/material manager/expert person).

The registration applies for each individual PPE (category 3). Many companies use a "log sheet" to register if a PPE has been issued or not. With the issuing of the PPE an inspection will take place (other than an annual inspection).

Electronic formats are also a possibility to register PPE. Think about the simple registration, searching and deleting of specific PPE.

Example:

Petzl / Beal etc. provide registration forms regarding the inspection of PPE. However, this is a guideline. If required, you can also make your own forms. Just keep the guideline of the manufacturer in mind.

## **5.6 Maintenance**

Wash & rinse in water (Ph neutral)

Don't wash with a high pressure cleaner

Wash textile by hand or washing machine (wash bag) in water (max. 30 degrees)

Let it dry in a well ventilated area, away from heat sources and UV

Lubricate moving metal parts (3 in 1, sewing machine oil)

Replace parts (work positioning systems, grillion robe / petzl stop, cam)

Read instructions manufacturer.

## **5.7 Storage**

Use a storage that can be locked

Prevent extreme temperatures

Avoid direct sunlight (UV)

Good ventilation

Store separately

Avoid aggressive substances

Avoid the presence of batteries

Read instructions manufacturer.

## 5.8 Life span

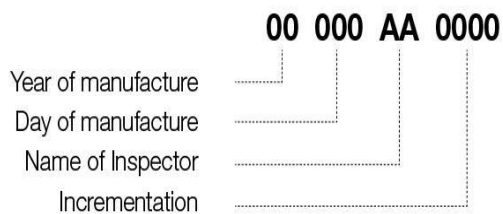
The lifespan is determined by the manufacturer. After the lifespan has expired the material will be rejected.

Manufacturers can mention a year of manufacture or an exact date.

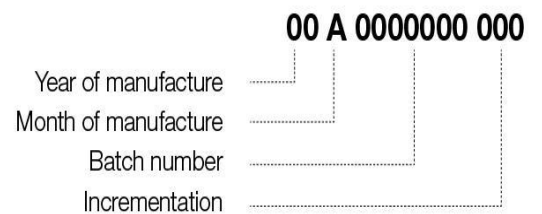
Petzl uses a batch system for this, for example:



Code A:



Code B:



Code A:

06            year of manufacture  
058          58th day of manufacture in 2006  
FB          code for the person that is responsible for the quality inspection  
2018        Incrementation, unique number of PPE

Code B:

16            year of manufacture  
A            Month of manufacture  
0002380    Batch number  
211         Incrementation, unique number PPE

Read instructions manufacturer.



## **5.9 Strengths**

Safe Working Load (SWL) = Maximum amount of kilograms that can be loaded on the product (this includes a safety margin, see specifications manufacturer).

Working load limit (WLL) = Number of kN whereby the relevant product does not function anymore.

(Number of kN is significantly lower than the BS)

Breaking strength (BS) = Number of kN whereby the relevant product will break.

## **5.10 Inspection**

An inspection regulation should take place. This can vary from a carabiner/harness hat should be fully inspected annually. If this is used in a dirty environment it might be decided that this should be inspected every 3 months.

**In doubt it can be determined to inspect the PPE  
sooner than the established date!**

The frequency of the annual inspection should be revised depending on the results of the storage and inspections.

We know 3 levels to perform inspections.

Before/during/after use, by the user

Interim inspection (fall, chemical contamination) by competent person

Annual inspection by competent person

# 6 Personal Protection Equipment

## 6.1 Helmets

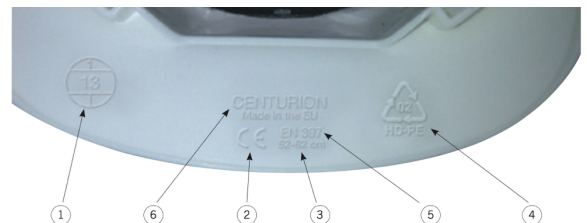
EN 12492 Alpine (sport / recreation) and EN 397 Industrial helmets.

The EN 12492 standard contains side, front and back energy absorption. The helmet will probably stay in place in case of a fall/collision as the helmet with “Y” shaped chin strap will come lose with a load above 50 kg



The EN 397 standard does not contain the side, front and back energy absorption and has a weaker chin strap (15 – 25 kg) than the EN 12492 Alpine helmet. However, the helmet is protected against electrical sparks/melting metal as this has an enclosed shell as well as extra options.

Rescue & industrial Working at Heights helmet is a combination of EN 12492 & EN 397 helmet. The Petzl Vertex Best with a EN 12492 alpine inside/chin strap on an EN 397 industrial shell



Conform EN 397 moeten minstens onderstaande gegevens onuitwisbaar aan de binnenzijde van de helmschaal aangebracht zijn:

1	Maand en jaar van fabricage	4	Materiaaleigenschappen
2	CE-markering	5	Norm
3	Maat	6	Fabrikant

Purpose:

- Protection of the head, during a fall/falling of material from above.
- Attachment of head light, earmuffs etc.

## 6.2 Harness

EN 12277 (harness sport)



EN 813 (sit harness PPE)

EN 361 (integral harness PPE)

EN 358 (work positioning PPE)



Purpose:

- Support during work activities
- Ensuring of connections with for example Cow's tail, fall protection etc.
- Material loops ensure for carrying or tools, pbm
- Possibility for integrated croll
- Break strength attachment points “A” 1500 Kg, 15 kN
- Break strength material loops, 10 Kg.

### 6.3 Descending equipment



EN 341 (PPE descending material)  
EN 12841 (set up equipment lines PPE)

Petzl I'D starts to slip at 4,5 kN with a 10 mm line, 6,5 kN with a 11 mm line and 7 kN with a 11,5 mm low stretch braided line, static load.

Purpose:

- Attachment of the used to the work line
- Realising a controlled descending/recue
- Ensuring of an auto-block in the lifting system
- Tightening of the overloading
  
- Break strength 150 Kg
- Using a deviation point 250 Kg

### 6.4 Back-up equipment



Asap Lock EN 353-2 / EN 12841  
(moving fall protector with flexible anchor line)

Petzl Shunt is not developed as back-up but is worldwide used as rope access back-up equipment. The user should have followed a training course regarding the Petzl Shunt. (for more information [www.petzl.com/shunt](http://www.petzl.com/shunt))

Petzl ASAP, Duck'r, ISC Rocker, DMM Buddy can be used as fall protection/back-up equipment. Check the diameter of the line before use and the required strength of the anchor point

Purpose:

- Attachment of the user to the safety line
- Absorbing shock-load during failure main line
  
- 2 types of absorbers:
  - L71 (1 person)
  - L57 (2 persons)



## 6.5 Ascension/jumar

EN 567 (ascenders / sport) & EN 12841 (set up equipment lines PPE)



To be used on low stretch braided or dynamic lines.

Load on the line can be approximately 2.5 – 6.5 kN (static load) before the line clamp will slip or the mantle will be damaged.

Teeth clams cannot be used in a shock load situation (> fall factor 1). This can cause mantle/line breaking (before use also check the other line clamps regarding their effect on the line in a shock load situation).

Purpose:

- Ascending on lines
- Descending on lines
- Make connection on the line with a puller in a hoist

## 6.6 Line

Dynamic lines

U.I.A.A. 101 (lines / sport) and EN 892 (dynamic climbing lines / sport)

With dynamic lines no breaking strength is given but a catch shock.

Dynamic lines are used instead of semi-static lines when there is a possibility of a fall, for example during climbing. In this case the stretch of the line absorbs the fall.

Dynamic lines are used for lanyard's / cow's tails.

Semi-static lines

EN 1891 (braided lines with little stretch PPE)

Type A (minimum 10 mm)

Type B (maximum 9.9 mm)

Semi-static lines are used as work line and safety line in vertical terrain. Also for "top rope" and speleology semi-static lines are normally used.

The EN requirement for Type A is a minimum breaking strength of 22 kN and a minimum of 5 x a fall factor 1, with a load of 100 kg.

In general, a semi-static line will crimp, 5% to 10% in water after the initial use. This will ensure that the mantle will slip less. Therefore, manufacturers will recommend to place the line in water before cutting. Line on a roll is longer than indicated, due to the crimping of the line.

The EN 1891 requirement of Type B does not match all the points to which Type A should comply. Type B is tested with a load of 80 kg and only suitable for specific use (such as a good risk assessment).

## 6.7 Connectors

Carabiners are made from steel and aluminium.

Carabiners can have the following locks, self-securing/not self-securing.

EN 12275 (connection pieces/sport)

Class B	wire gate
Class H	HMS carabiner
Class K	Klettersteig carabiner

Class A	MGO hook
Class Q	Maillon rapide
Class D	Snapper
Class X	Ovale



EN 362 (connections PPE)

Class B	Screw
Class M	multi-use carabiner Petzl Omni
Class A	Auto lock MGO hook
Class Q	Maillon rapide

Purpose:

- Attachment from the equipment to the lanyard/cow's tail
  - Attachment of ropes to an installation
  - Attachment of tools, rope bags etc.
- Break strength depending on type and shape

## 6.8 Open Sling

EN 566 (loops / sport)

EN 795B (temporary anchor provision)

Check for friction/incision/stitches.

Open sling is normally made from nylon, dyneema and nylon or just dyneema. For storage the same applies as with lines. Dyneema has a low melting point and little to no stretch. Plus, dyneema slings are weak when they are knotted. Keep this in mind before use.

An open sling wears more easily than a line as it is not equipped with line protectors. Use line protectors for this or consider an open sling equipped with a line protector when purchasing.

Climbers often use their own knotted sling. The only suitable knot is the back stitch bag knot.

Only slings that are stitched, tested and CE marked may and can be used as PPE in a Working at Heights situation!



## 6.9 Wire strop

EN 795B (temporary anchor provision PPE)

Steel nooses are often used in the industry (sharp parts, chemicals, heat etc.). Various types are possible, such as cover, nylon/plastic mantle, with/without a drop, steel or stainless steel etc.



## 6.10 Etriers

Etriers are often used in combination with an ascension, to move easier with several foot loops for example with aid-climb.

## **6.11 Edge protection (edge management)**

### **6.11.1 Hierarchy of rope protection**

#### **Hierarchie**

In rope access work it is vital to ensure that ropes are protected with a suitable method. An hierarchical approach should be adopted in order to determine the best achievable method of protection for ropes at a worksite.

The following process should be followed:

- 1.) Remove the hazard where feasible (source approach).
- 2.) Avoid the hazard.
- 3.) Protect against the hazard.

The process may be remembered by the acronym “RAP”.

Examples;

#### **1.) REMOVE THE HAZARD**

- Removing a sharp edge;
- Removing a heat source.

#### **2.) AVOID THE HAZARD**

- An alternative anchor;
- An Y-hang;
- The provision of a barrier (eg scaffold tube);
- Introducing a deviation;
- Using a re-anchor.

#### **3.) PROTECT AGAINST THE HAZARD**


- For edges, using an appropriate edge protector;
- For other surface hazards, use an appropriate rope protection;
- Each rope should be independently protected.

# PREVENT DAMAGE TO ANCHOR LINES

## YOUR LIFE DEPENDS ON IT

HIERARCHY

**01. IDENTIFY THE HAZARD**




**IDENTIFY ALL HAZARDS IN THE ANCHOR LINE PATH. EXAMPLES OF HAZARDS:**

⚠ SHARP	⚠ HOT	⚠ TOOLS	⚠ ENTANGLEMENT
⚠ ABRASIVE	⚠ CORROSIVE	⚠ WIND	⚠ ENTRAPMENT

---

**02. REMOVE THE HAZARD**



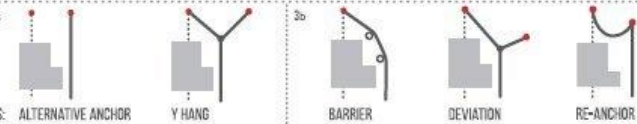
**EXAMPLES:**

- REMOVE SHARP EDGE
- REMOVE HEAT SOURCE
- REMOVE SOURCE OF ENTANGLEMENT

---


**03. AVOID THE HAZARD**

3a



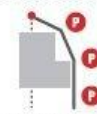
**EXAMPLES:** ALTERNATIVE ANCHOR    Y HANG    BARRIER    DEVIATION    RE-ANCHOR

3b




---

**04. PROTECT AGAINST THE HAZARD**



- FOR EDGES, USE AN APPROPRIATE EDGE PROTECTOR
- FOR OTHER SURFACE HAZARDS, USE AN APPROPRIATE ANCHOR LINE PROTECTOR
- EACH ANCHOR LINE SHOULD BE INDEPENDENTLY PROTECTED

P - PROTECT

---

**05. VERIFY**

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



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

ICOP 2.11.3.2.1

NOTE: ONLY ONE ANCHOR LINE AND ONE ANCHOR SHOWN FOR CLARITY    KEY: 3a, 3b: SEE ANNEX P, TABLE P1    COPYRIGHT © 2016 IRATA INTERNATIONAL    FM-120FNG V008 07/03/2017

UNCONTROLLED WHEN PRINTED



## 6.11.2 Types of rope protection

### 1.) Light weight (minimal) rope protector

Minimalistic (canvas/pvc) model rope protector. **Only protects against minimal abrasion against an edge!**

*(Lyon rope pro, Petzl protec)*



### 2.) Edge protector

The edge is covered so ropes will always be protected.

Most types can accommodate multiple (sets of) ropes.

Depending on the construction of the protector ropes can glide over/through the protector (lowering/hauling).

*(CMC Ultra pro, Petzl roll module, Heightec Edge protector, DMM propad)*



### 3.) Insert rope protector

Suitable for protecting ropes in holes such as grating.



*(5th point Vortex, DMM Edgehog)*

### 4.) Hot protector

Made out of glassfibre and aluminium.

Protects the ropes (for a very short period of time) against sparks (eg welding) or hot surfaces.

**Attention: Even when protected rope should never be placed directly against a hot surface!**

*(Beal Hot protector)*



## 5.) Cut/grind protector

Protects the ropes (for a short period of time) against abrasive tools such as grinders, saws etc.



*(Beal rope armour,  
Heightec Sentinel)*

### 6.12 Work seat

Ensures for comfort during work activities. Also during the practise of rescues is it nice to use a stage. Work seat is not a part of the safety system.

### 6.13 Pulleys

Pulleys are used in lifting systems to minimize the friction. They can also be used to change the direction of the lines.

There are also pulleys equipped with a blocking function, remember an auto-block in a lifting system.

### 6.14 Work Restrain

EN 358 (work positioning PPE)

Available in various versions, some can be operated with one hand, others require two hands. A fall from less than 0,5 metres is allowed under the standard but it is better not to fall during work positioning, no energy absorber!



## 6.15 Fall protection

EN 354 (PPE against falling - lanyard, safety line)  
EN 355 (PPE against falling – shock absorber)  
EN 958 (energy absorption systems / sport))



EN 958 is tested with 80 kg, the industrial version EN 354 / 355 is tested with 100 kg.

Applicable standards on personal protection equipment/rescue/industrial legal instruments

## 7 Standards work equipment

- BS EN 341 Personal protection equipment against falling – descending material
- BS EN 353-1 Personal protection equipment against falling by using moving fall protector with rigid anchor line
- BS EN 353-2 Personal protection equipment against falling - moving fall protector with flexible anchor line
- BS EN 354 Personal protection equipment against falling – Lanyard, safety lines
- BS EN 355 Personal protection equipment against falling – Shock absorbers
- BS EN 358 Personal equipment for work place positioning and to prevent falling – Harness for work place positioning and retention and connection equipment for harness.
- BS EN 360 Personal protection equipment against falling – Fall protector with automatic line tightening
- BS EN 361 Personal protection equipment against falling – Integral harness
- BS EN 362 Personal protection equipment against falling - Coupling
- BS EN 363 Personal protection equipment against falling - Personal protection equipment against falling
- BS EN 364 Personal protection equipment against falling – Testing methods
- BS EN 365 Personal protection equipment against falling – General requirements for user instructions, maintenance, periodical inspection, repair, marking and packaging.
- BS EN 813 Personal protection equipment against falling – Sit harness
- BS EN 1891 Personal protection equipment against falling – Braided lines with little stretch
- BS EN 1909 Safety requirements for cable cars for personal transport – rescue and evacuation
- BS EN 12841 Personal protection equipment against falling – Systems regarding work activities with a secured line – set up equipment for lines

## **7.1 General requirements for instructions**

BS EN 1868 Personal protection equipment against falling – List of similar terms.

## **7.2 Mountaineering & climbing equipment standards**

- BS EN 564 Mountaineering equipment – Support lines – Safety requirements and testing methods
- BS EN 565 Mountaineering equipment – Strap - Safety requirements and testing methods
- BS EN 566 Mountaineering equipment – Loops - Safety requirements and testing methods
- BS EN 567 Mountaineering equipment – Ascenders - Safety requirements and testing methods
- BS EN 568 Mountaineering equipment – Ice hooks - Safety requirements and testing methods
- BS EN 569 Mountaineering equipment – Pitons - Safety requirements and testing methods
- BS EN 892 Mountaineering equipment – Dynamic climbing lines - Safety requirements and testing methods
- BS EN 893 Mountaineering equipment – Crampons - Safety requirements and testing methods
- BS EN 958 Mountaineering equipment - Energy-absorption systems for use in "klettersteig" - Safety requirements and testing methods
- BS EN 959 Mountaineering equipment – Cliff hooks - Safety requirements and testing methods
- BS EN 12270 Mountaineering equipment – Clamps - Safety requirements and testing methods
- BS EN 12275 Mountaineering equipment – Connection pieces - Safety requirements and testing methods
- BS EN 12276 Mountaineering equipment – Friction anchors - Safety requirements and testing methods
- BS EN 12277 Mountaineering equipment – Harness - Safety requirements and testing methods
- BS EN 12278 Mountaineering equipment – Pulleys - Safety requirements and testing methods

BS EN 12492 Mountaineering equipment – Helmets for mountain climbers -  
Safety requirements and testing methods

### **7.3 General standards**

BS EN 397 Industrial safety helmets

BS EN 795 Personal protection equipment against falling – Anchoring provision

### **7.4 Rescue standards**

EN 1496 Personal protection equipment against falling – Lifting equipment for  
rescue purposes

EN 1497 Personal protection equipment against falling – Rescue harness

EN 1498 Rescue equipment – Rescue loops

### **7.5 UIAA Standards**

UIAA 101 Lines

UIAA 102 Accessory cord

UIAA 103 Tape

UIAA 104 Sangel

UIAA 105 Harness

UIAA 106 Helmet

UIAA 107 Braided lines with little stretch

UIAA 121 Couplings/carabiners

UIAA 122 Piton

UIAA 123 Cliff hooks

UIAA 124 Clamps

UIAA 125 Friction anchors

UIAA 126 Line clamps

UIAA 127 Pulleys

UIAA 128 Energy absorbers

UIAA 129 Breaking equipment

# 8 Knots

## 8.1 Double eight knot

The eight knot serves to make a loop at the end of the line. Eight knot can also be crossed back around a subject.



Please ensure:

- That the knot is loaded lengthwise;
- That the end is at least 10 x the diameter of the line;
- That the loop is made as small as possible. Remember lifting efficiency
- 23 to 34% loss of breaking strength

## 8.2 Bunny ears

Also known as the German eight or the Micky Mouse knot ((double figure eight loop) is used as:



- anchoring whereby you can use two loops when you use the knot individually, a safety knot should be present at the unused end of the knot.
- Knot that you can anchor as force triangle at the same time
- As indented anchoring (two staggered loops) so you create more insight and an easier operation in the installation
- Both loops should be loaded at the same time
- 23 to 39% loss of breaking strength



### 8.3 Double fisherman's knot

This double fisherman's knot is used for:



- To connect two ropes with the same features (mainly with slippery and wet ropes), disadvantage of the double fisherman's knot: it often cannot be loosened in case of much load or with thinner ropes and therefore has to be cut free.
- 20 % loss of breaking strength

### 8.4 Bowline

The bowline is used:



- As a knot it will receive much load, this is because the knot can be easily loosened (especially if you make the knot with a double rope)
- With a safety knot at the unused end of the knot as the knot is easily loosened it might easily move with loading on the used rope
- 60 to 65% loss of breaking strength

## 8.5 Barrel knot

Also known as the double overhand knot, stopper knot, this knot is used:



- as stopper knot below in the “descending” rope, especially when it is not visible if the rope reaches the ground (dark, overhang, wind, etc.)
- In the unused end of the knot as some knots have to risk to become loose under certain circumstances
- So that the rope cannot glide through an automatic blocking device
- Loss of breaking strength not applicable

Variation of the safety knot is the barrel knot, this knot is used:

- When a rigging should be as compact as possible, small spaces
- To attach cow's tail to your harness instead of the eight knot
- 23 to 33% loss of breaking strength

## 8.6 Butterfly knot

Also known as the alpine butterfly knot, butterfly loop, butterfly knot, lineman's loop of alpine butterfly loop) is used:



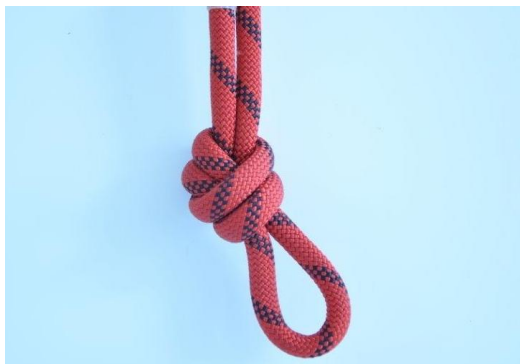
- as a knot that can be loaded in all directions without losing its shape

When a rope is damaged this knot is made so that the break of the rope lies in the loop of the knot.

- When anchoring a force triangle, often combined with an eight knot (Y-hang)
- 28 to 39% loss of breaking strength

## 8.7 Overhand knot

This knot is used:



- With several ropes, these knot is easy to make and to model
- To attach cow's tail to your harness instead of eight knot
- 60 to 70% loss of breaking strength

## 9 Anchor systems

According to European/Dutch law and legislation we are obliged to work with two lines, the work line and the safety line that are connected separately. This can be achieved by positioning of for example 2 steel nooses on a H-beam.

If one of the lines fails, either the work line or the safety line, the Rope Access operator will not fall down and will be prevented from injury.

Irata International also obliges its employee to work with two lines connected separately, the work line and safety line.

There are various possibilities to attach the lines.

### 9.1 Basic rigging

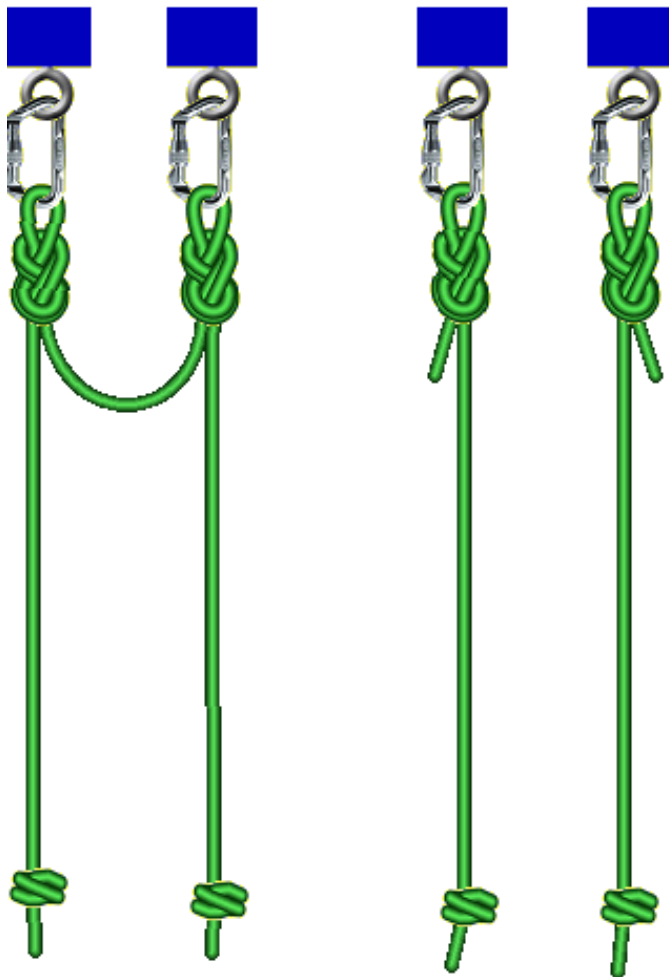


Figure 1

Figure 2

Attachment of two lines, separately.

Figure 1 uses one line that has two eight knots in the middle. End is equipped with safety knots.

Figure 2 uses separate lines, both equipped with an eight knot. End is equipped with safety knots.

There is also the possibility to attach the loops of both eight knots to both carabiners (load sharing).

## 9.2 Y-Hang

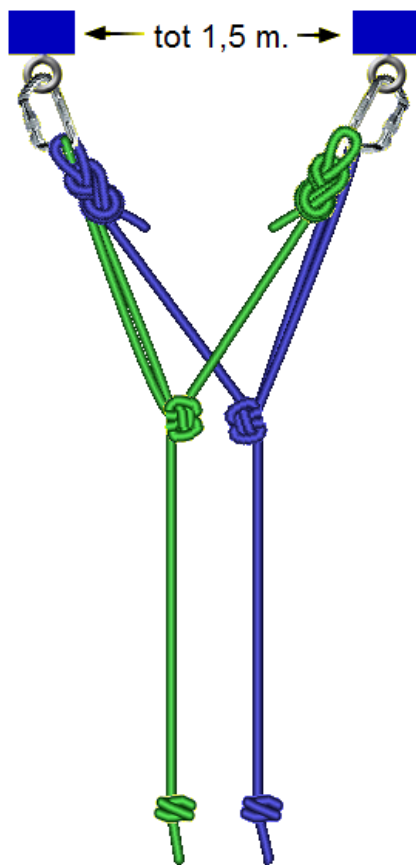


Figure 3, small Y-Hang

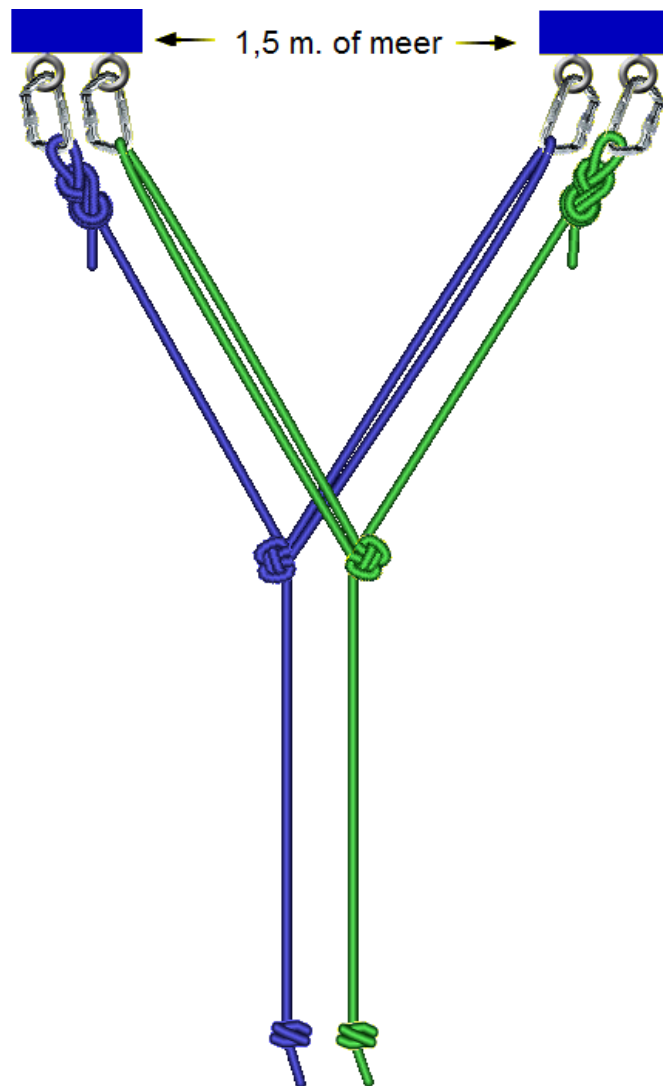


Figure 4, wide Y-Hang

A Y-Hang is used to position a work line/safety line. A dividing advantage of the load is also used here in relation to the anchor points.

A Y-hang is made with an eight knot and the butterfly knot. Whereby the butterfly knot can be used to position the rigging.

Figure 3 is a Y-hang < 1.5 metres. With a Y-Hang < 1.5 metres the eight knot of the blue line and the butterfly knot of the green line can be attached in a carabiner and vice versa.

One should always consider the two contact points

Figure 4, is a Y-Hang > 1.5 metres. The work line is attached with an eight knot and a butterfly knot at two contact points as well as the safety line.

Please consider 4 contact points. This is case of failure of one of the lines which causes an undesired pendulum.

Important:

- < 1.5 metres, 2 contact points
- > 1.5 metres, 4 contact points

### 9.3 Angles and forces (anchor point)

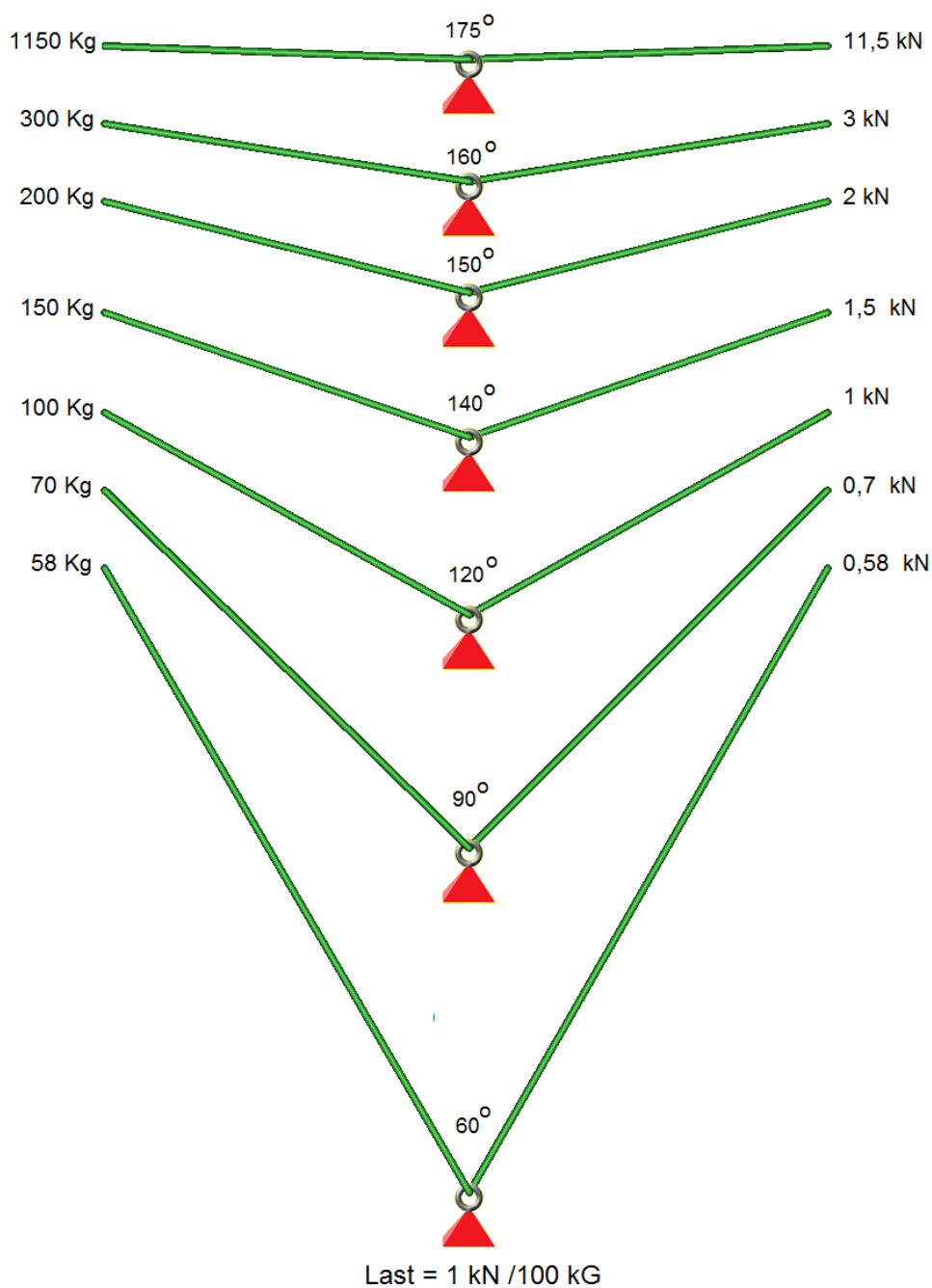
With a Y-hang a division advantage is used regarding the forces

With an angle less than 120 degrees the forces on the anchor points are reduced and one calls this a division advantage (see table below).

With an angle bigger than 120 degrees the forces on the anchor points will increase (see table below)

With an angle of 120 degrees the forces on the anchor points will remain the same as the load.

Please ensure that a Y-hang is installed below 90 degrees with regards to the forces on the anchor points.



## 9.4 Re-Anchors

Re-Anchors are used to keep the lines away from possible danger or to position the rope access operator closer to his work place. An advantage of a re-anchor is also that the lines are shorter, from the ground to the work place, so there is less stretch in the lines.

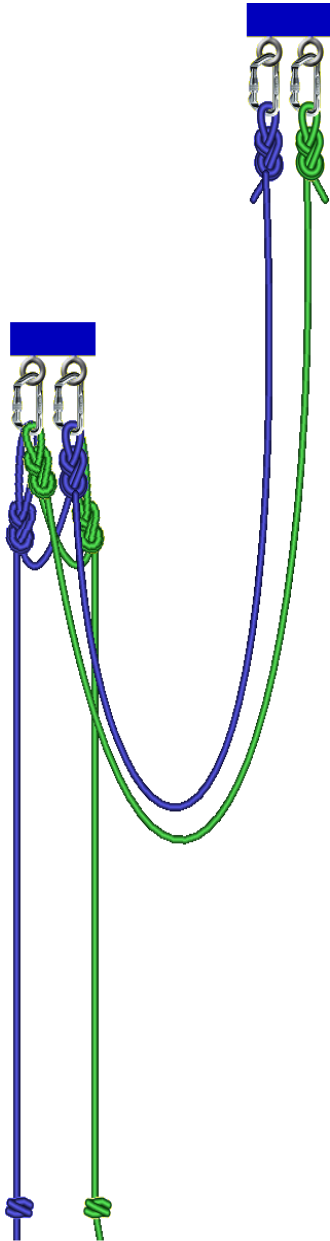


Figure 5, a small re-anchor, < 1.5 metres. Two contact points.

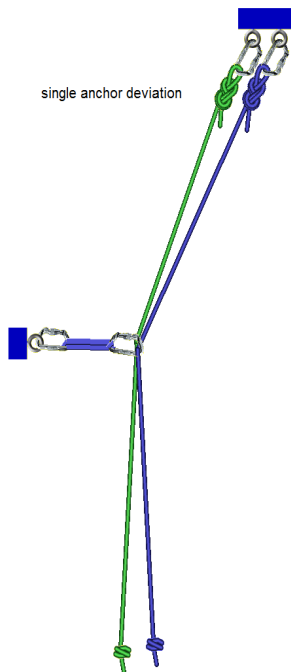
With a wide re-anchor there will have to be four contact points.

Figure 5, small re-anchor

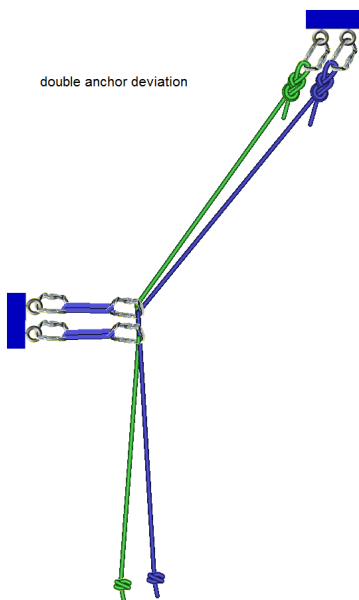


## 9.5 Deviation

Deviation is used to change the direction of the lines, whereby the rope access operator can get even closer to the work place. Plus, the lines can also be kept away from possible danger. An advantage of a deviation regarding a re-anchor is that a deviation can also be installed as rig to rescue.

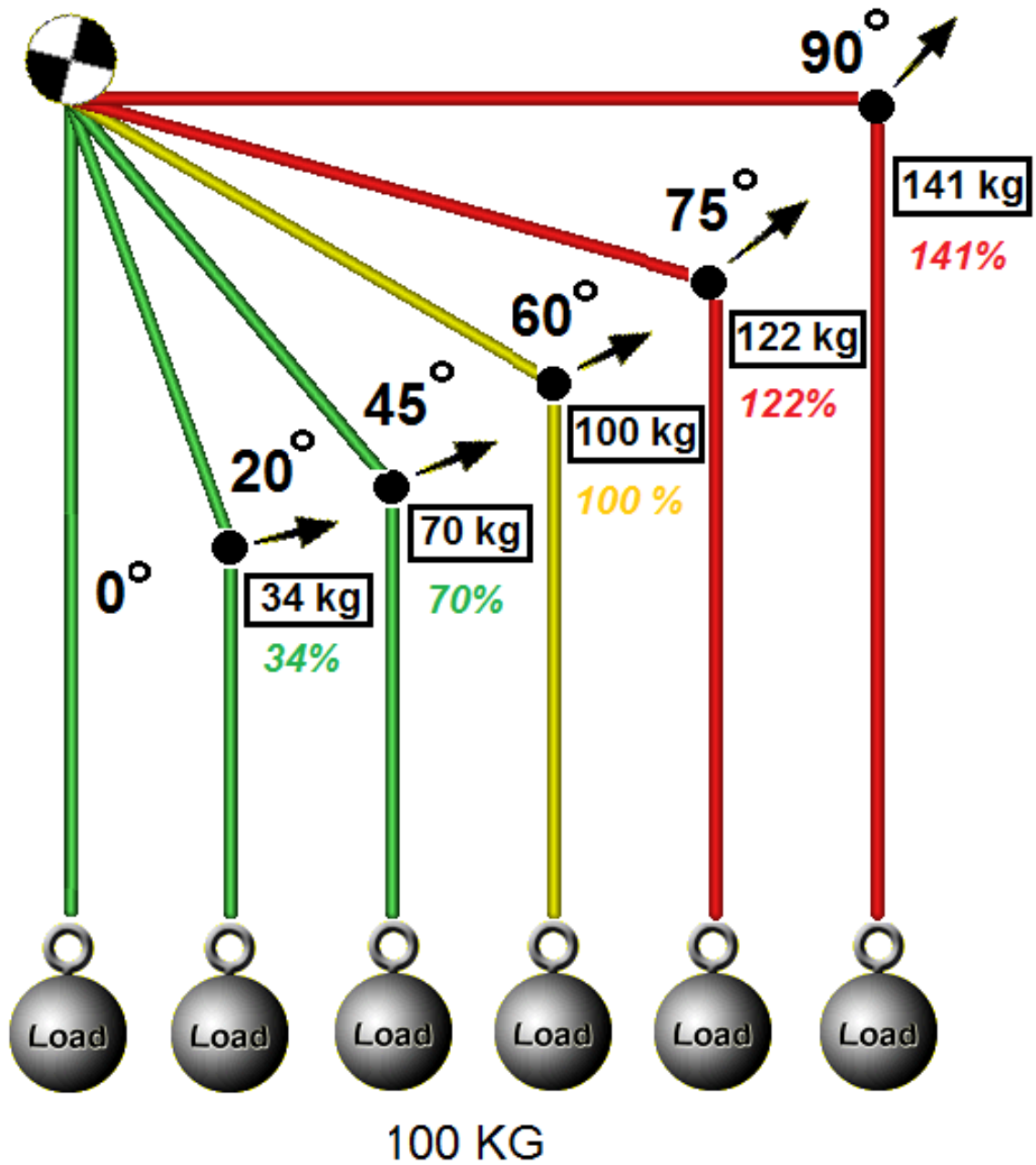


Single anchor deviation is used with a small angle whereby the danger of a pendulum, in case of failure, against a building, scaffolding etc. can be neglected.



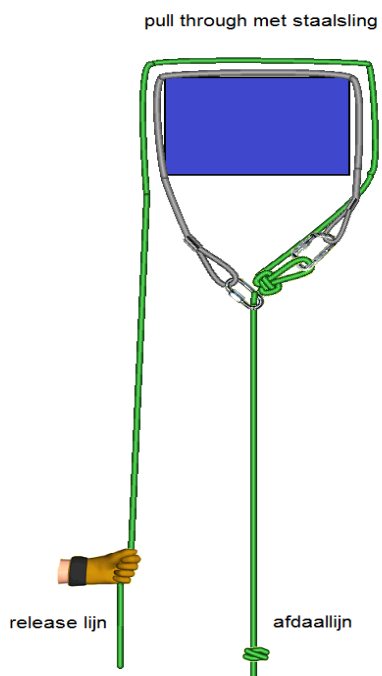
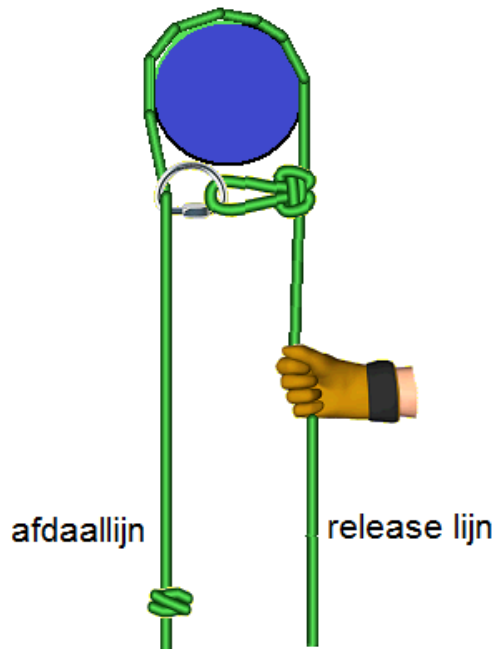
Double Anchor deviation is used with a large angle whereby the danger of a pendulum, with failure, against a building, scaffolding is very big.

### 9.6 Angles & strengths (deviation point)



## 9.7 Pull-through

A pull-through provides the opportunity to descend at the end of the work activities at the work place without having to go back to the starting point. The rope access operator will recover his lines without leaving material behind.



## 9.8 Work restrain / Life line

With a system for work place limitation a work space can be limited so that the employee cannot move to a zone with a potential risk of falling. This installation is meant to prevent a fall and not to absorb a fall (not equipped with an energy absorber).



## 9.9 High lines

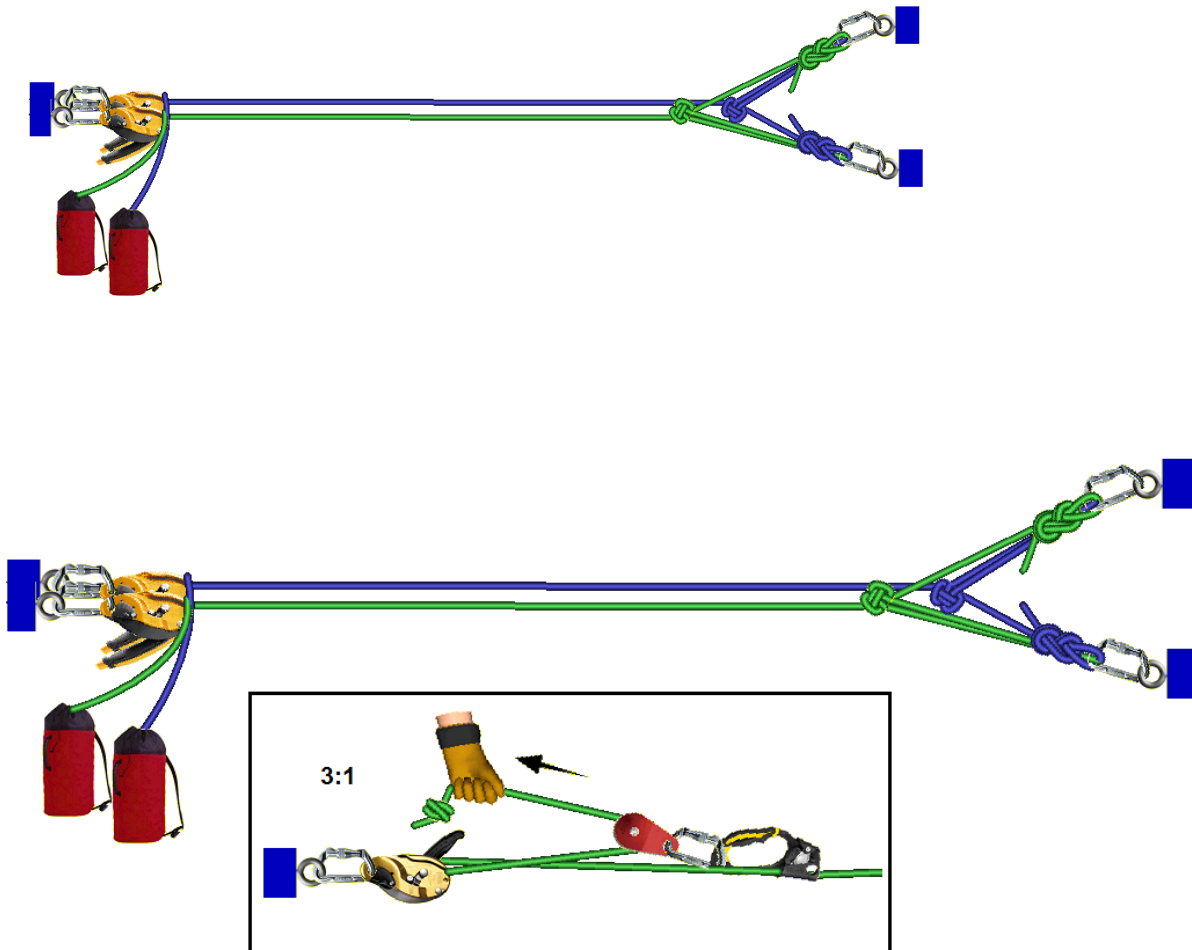
High lines are used at the moment it is no longer possible to move a load in a vertical manner. Deviation of the descend.

We divide horizontal/diagonal high lines . With the use of an high line the rope technician will have to consider the angles and forces of the anchor point.

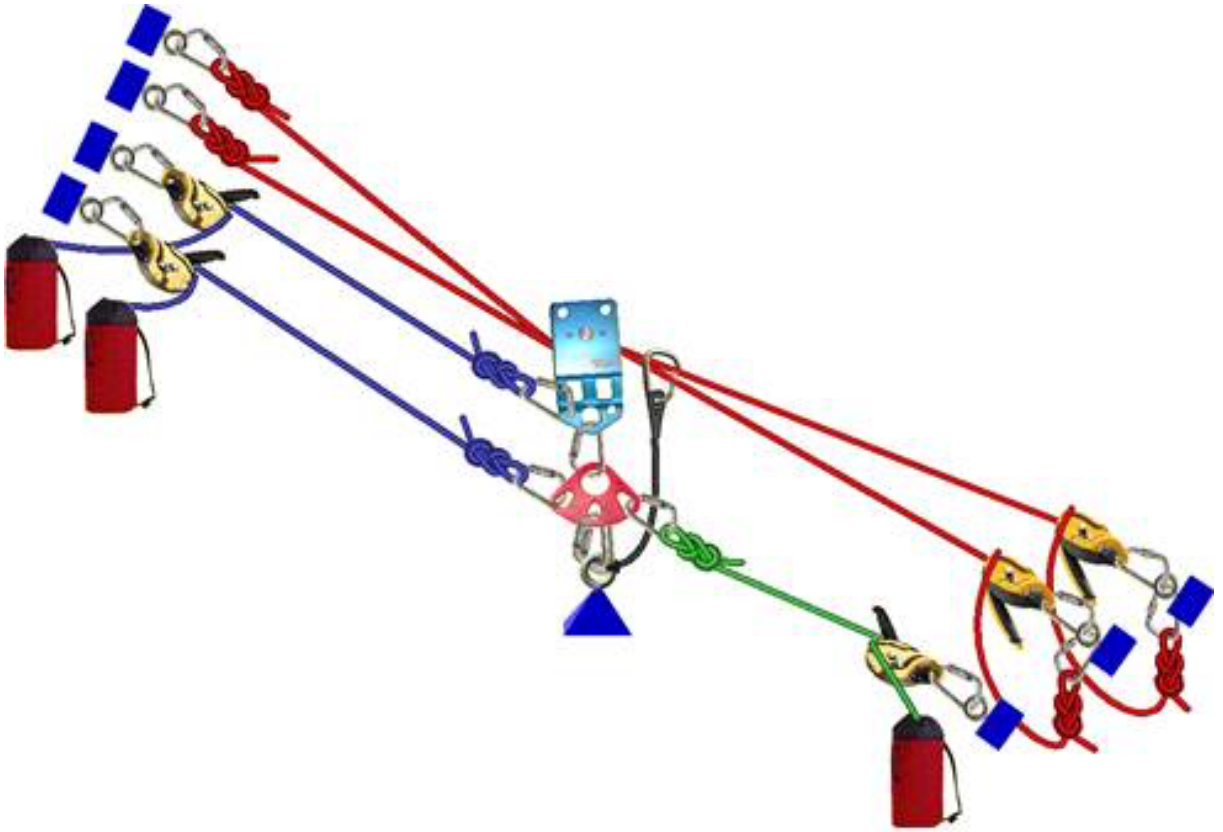
The angle occurs when a load is hanging in the high line. Depending on the sagging angle the force on the anchor point will reduce/increase (see 9.3 Angles and Forces).

During the installation one should consider the following:

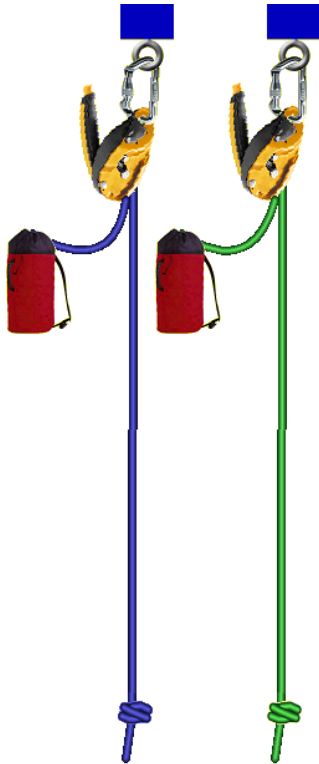
- Anchor points
- Release system
- Type of line (both with the same features)
- Hauling system (3:1, 1 person, depending on the angle & forces anchor point)
- 2 contact points



Dianonal high line

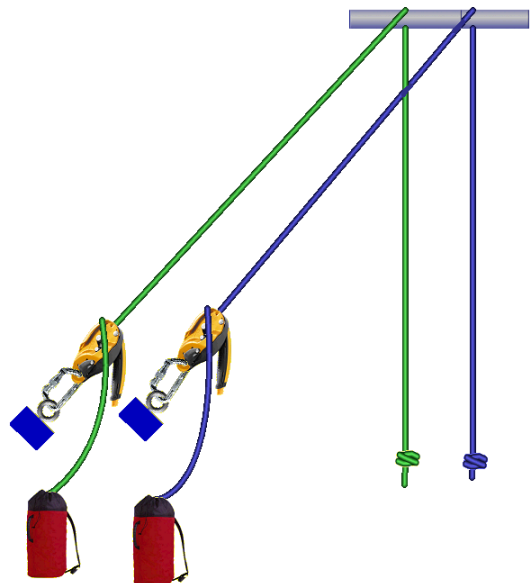


## 10 Rigging to rescue



Rig to rescue provides the opportunity to lower a person without performing extra actions, in case of emergency. When the system is actually operated, a deviation point will be used that ensure for extra friction. This deviation point is created by placing an extra carabiner at the I'D.

With the use of two I'D's (share loading) an extra deviation point is not required.



# 11 Fall factor

The fall factor shows the forces that occur with a fall. It concerns the relation between the height of the fall and the length of the life line.

Apart from all the PPE that can be used to prevent the risks that can occur with a fall, you are responsible yourself to continuously be aware in order to limited the fall factor as much as possible.

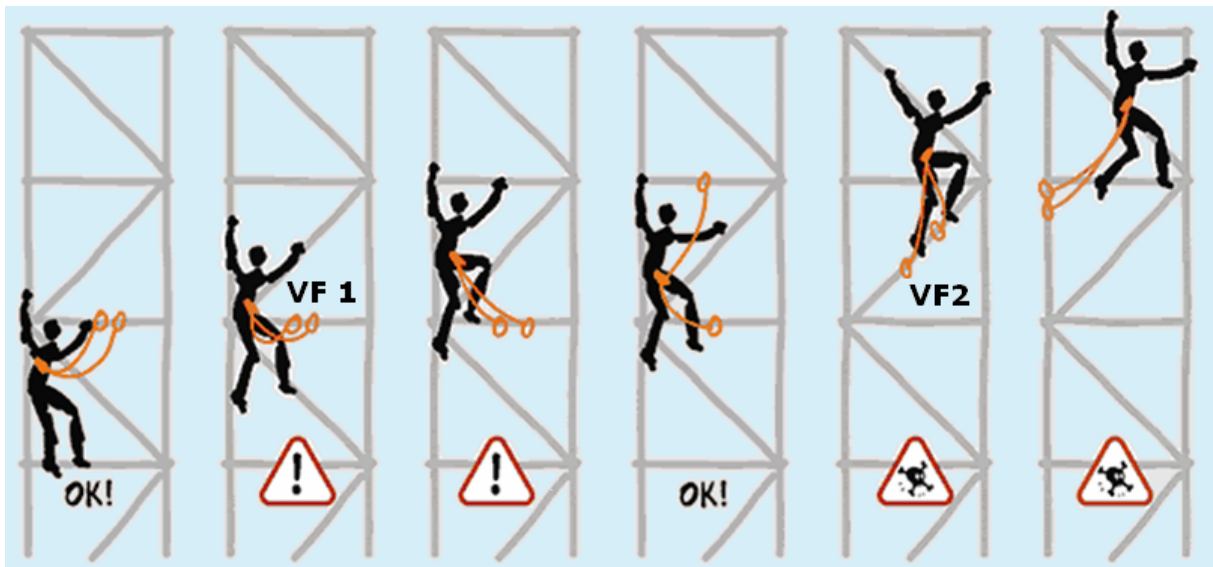
The fall factor can be calculated with the formula below:

$$\text{Fall factor} = \frac{\text{Height of the fall}}{\text{Length of the life line}}$$

We can divide the fall factor into:

- Fall factor 0
- Fall factor 1
- Fall factor 2 / 2 +

Fall factor 0 is the lowest in this case and fall factor 2+ is the highest. When the possibility of a fall occurs a fall absorber/dynamic lines has to be used. The fall absorber will reduce the force on both the body as the anchor point to below 6 kN. When using a dynamic line, the length of the line and the knots will ensure absorption of the shock load.



Fall factor 0    Fall factor 1    Fall factor 2    Fall factor 0    Fall factor 2+    Fall factor 2+



The calculation of the forces on the body/anchor point can be done with the following formula:

$$F = M \times G \times H$$

F = force expressed in kN

M = mass expressed in kg

G = gravity

H = fall distance

#### Example 1

M = 100 KG (body weight + clothing + PPE + tools)

G = 9,81 Newton (gravity)

H = 0,5 meter (height/fall distance)

**Result F= 490 kg (= rounded to 4900 N) = 4,9 KN**

#### Example 2

M = 90 KG (body weight + clothing + PPE + tools)

G = 9,81 Newton (gravity)

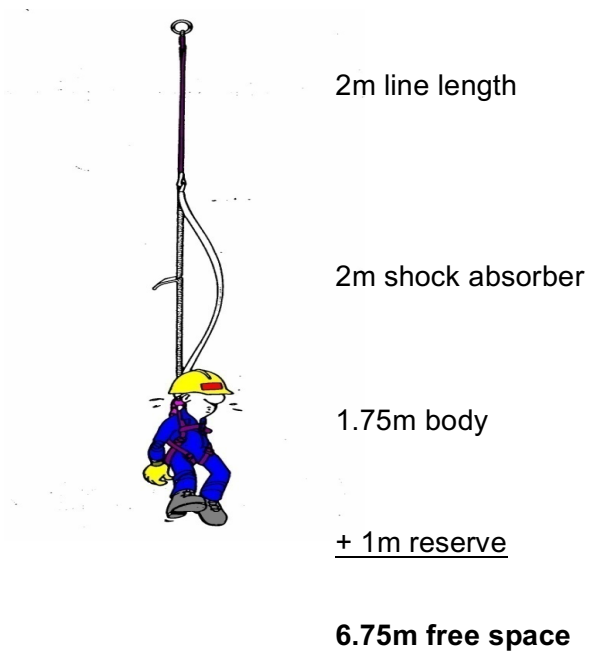
H = 1,2 meter (height/fall distance)

**Result F= 1059 kg (= rounded to 10590 N) = 10,6 KN**

## 11.1 Free space

Free space means space that is required to fall freely without hitting the ground (obstacles not included).

Calculation free space:



# 12 Hauling systems

A hauling system is used to bring a load upwards with minimal effort. There are various types of hauling equipment that can be used to bring a load upwards, all have their own advantages and disadvantages.

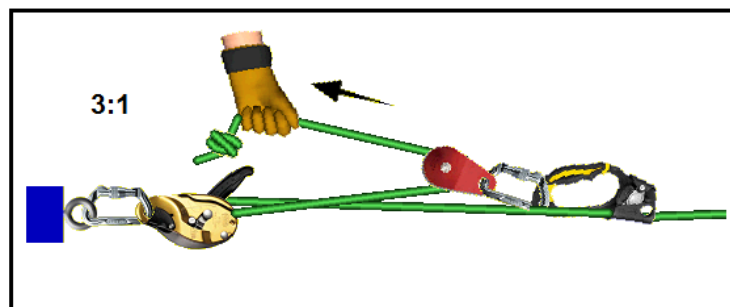
To create a hauling system one should consider the following:

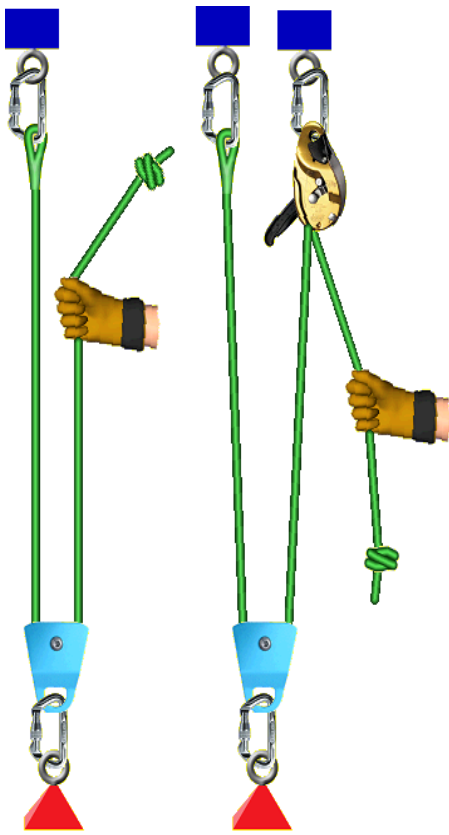
- Possible dangers
- Location
- Outlet casualty during rescue
- Required materials

The materials required to build a hauling system should at least contain the following:

- Pulley (minimalizes the friction in the system)
- I'd (auto blocking function)  
advantage: easy to lower the load  
disadvantage: much friction
- Pulley with auto blocking function  
advantage: less friction  
disadvantage: difficult to lower the load
- Tooth, profile clamp
- Carabiners (attaching pulley / I'd)
- back-up system (I'd / asap)

Please consider the purpose of the use. With a hauling system with too much mechanical advantage, the system can become overloaded. Remember, the load might get stuck.





2:1

2:1 met omleiding

Figure 6

Figure 6a

In figure 6 a hauling system is built with a mechanical advantage of 2:1.

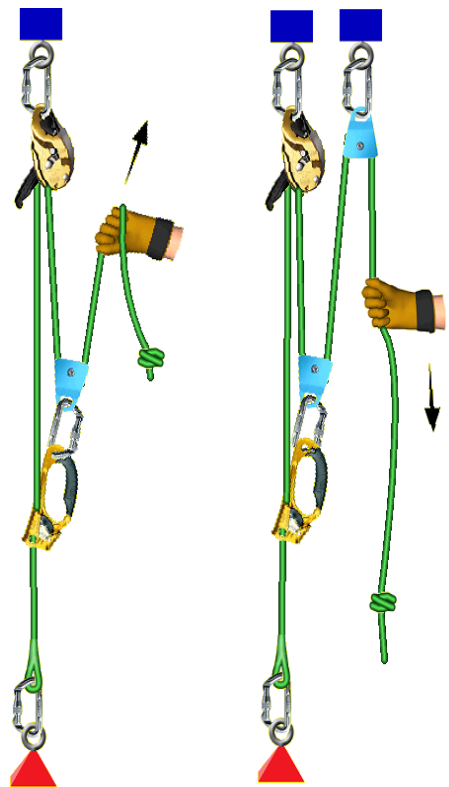
This means:

That when the load is 1 kN, actually 0,5 kN has to be lifted (regardless the friction of the pulley)

Plus, one should lift two metres to raise the load one metre.

In figure 6 only a pulley is used. When letting go of the hand the load will fall down.

In figure 6a a pulley and an I'd as recoil blocking is used. When letting go of the hand the load will remain hanging.



3:1

3:1 met omleiding

Figure 7

Figure 7a

In figure 7 a hauling system is built with a mechanical advantage of 3:1.

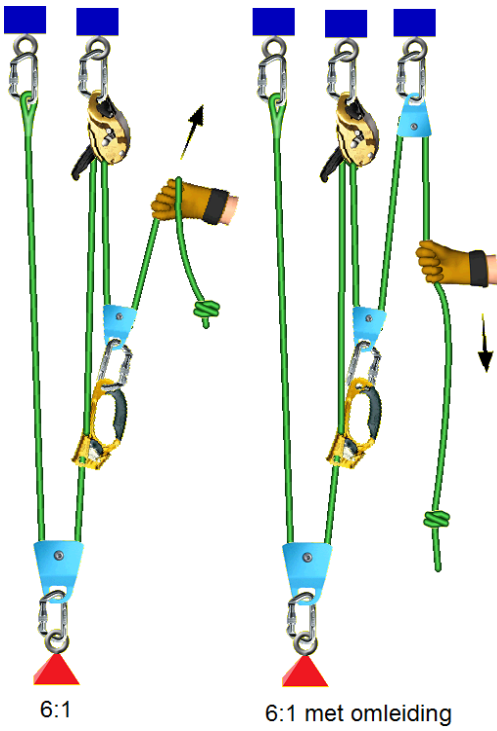
This means:

That when the load is 3 kN, actually 1 kN has to be lifted (regardless the friction of the pulley)

Plus, one should lift three metres to raise the load one metre.

In figure 7 an I'd, a pulley and an ascension are used. The ascension ensures for a connection with the pulley on the line.

In figure 7a an extra pulley is used that ensures that the pull direction is changes (does not provide mechanical advantage).



In figure 8, 8a a 2:1 is combined with a 3:1. With a combined hauling system the two hauling systems may be multiplied. This results in 6:1.

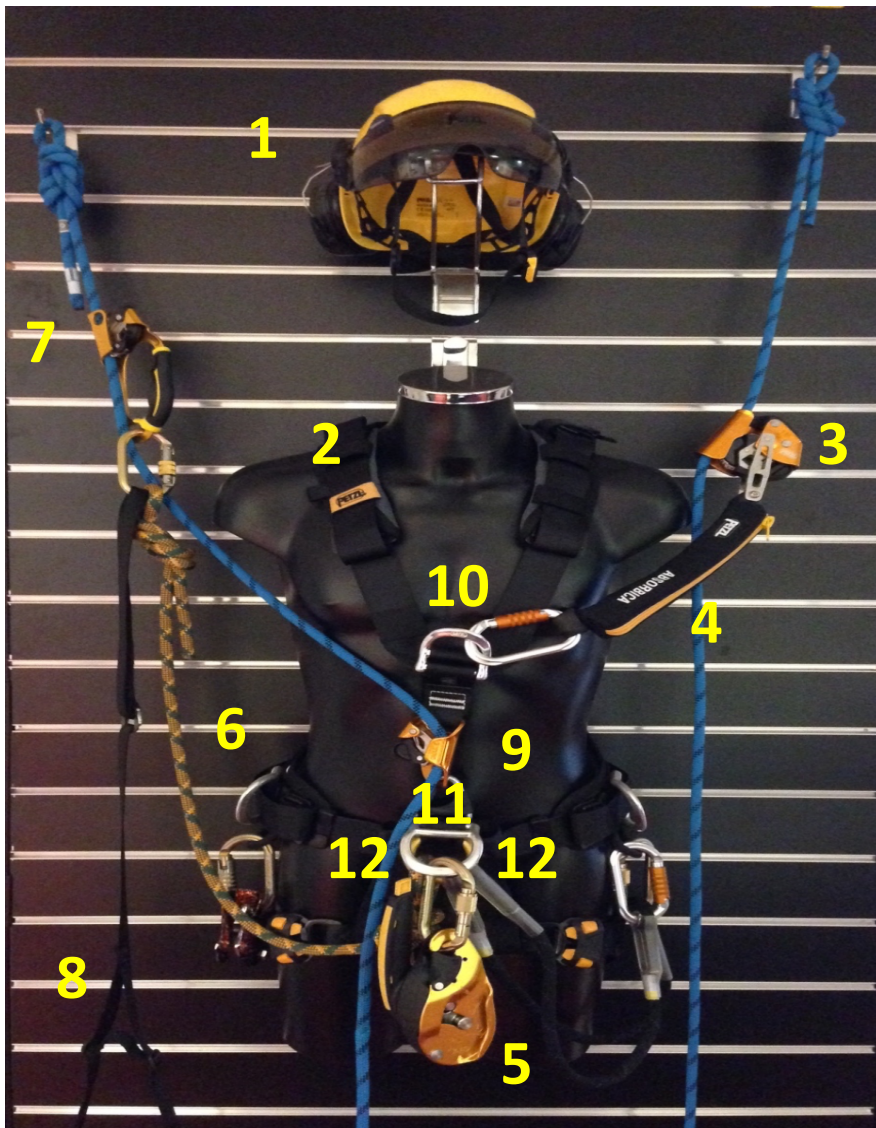
Figure 8

Figure 8a

# 13 Rope Access techniques

## 13.1 Introduction PPE

- Cow's tail, (dynamic) correct length regarding operating material
- Quote use-features of cow's tail:
  - Dynamic
  - Length
  - Well tightening of knots (release air)
  - Attachment maillon (eight knot/safety knot)
- Ascension with foot loop attached to cow's tail on right side
- Move foot loop when not in use
- Attach Asap to top binding point (EN 361)
- Attach carabiner to cow's tail on left side (2 x)
- Attach descending equipment to lowest D-ring integral harness with opening/carabiner upwards. (EN 341)
- Attach Croll to maillon/ t-rap/ top croll/ secure (if not integrated)
- Material can be used in various way. Reduces amount of weight and materials required.
- Climbing helmet. Industrial, if not available, clearly quote various helmets.



1. Helmet  
EN 397 / 12492
2. Harness  
EN 813 / 361 / 358
3. Asap  
EN 353 – 2
4. Energy absorber  
EN 355
5. I'D  
EN 341
6. Lanyard / Cow's tail  
EN 354 / EN 892
7. Ascension  
EN 567 / 12841
8. Foot loop
9. Croll  
EN 567
10. 1<sup>st</sup> Attachment point  
Harness/safety line
11. 2<sup>nd</sup> Attachment point  
Harness/working rope
12. Connection points for  
working seat  
(not a part of the safety  
system)

### **13.2 Ascending croll combined with asap**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Place asap on the safety line. Safety line can be found on the left side.
- Place the work line in the croll and close this.
- Place ascension with foot loop above the croll on the work line. Remember screw-carabiner gravity loaded.
- Place your foot in the foot loop of the ascension.
- Push the ascension upwards and keep the work line between the legs.
- Remove possible slack from the line.
- Push yourself upwards and consider the slack that might occurs by pushing too fast or because of not enough rope mass.
- The rope will calmly mover through the croll
- In case of not enough rope mass it can be recommended to place both feet on the rope (remember dirt/grease etc. under the foot sole). This will ensure that the rope stays tight and there will be no slack in the beginning.
- Ensure that the asap is taking along while ascending. Remember the fall factor in case of failure of the work line. Make sure that the asap stays above the shoulder.
- When using the asap it is necessary that the absorber is on the left arm. Remember the fall factor in case of failure of the work line.

### **13.3 Descending croll combined with asap**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Asap is already places on the safety line.
- The croll/ ascension can be found on the work line
- The ascension is brought down, about 30 – 40 cm.
- Go and stand in the ascension, release the croll and push the catch of the croll down with your finger in the middle so that the teeth do not cut the rope.
- Calmly descend the desired distance and calmly release the catch of the croll so it regains its operation.
- Make sure the student does not descent too much and cannot reach the ascension anymore to release this, approx. 40 cm.
- Repeat this procedure till the student has descended to the desired distance.
- With the asap it should be considered that the absorber is across his left arm. Remember the fall factor in case the main line breaks.
- Ensure that the asap is no longer in the “lock position”.

### **13.4 Ascending I'd combined with asap**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Place asap on the safety line. Back-up rope is on the left side.
- Place the work line in the ID and close this.
- Place ascension with foot loop above the ID on the main line. Remember screw-carabiner gravity loaded.
- Place your foot in the foot loop of the ascension.
- Push the ascension upwards and keep the main line between the legs.
- Push yourself upwards and consider the slack that might occurs by pushing too fast.
- At the moment that the ID is not used it should be placed in work position.
- When using the asap it is necessary that the absorber is on the left arm. Remember the fall factor in case of failure of the main rope.

### **13.5 Descending I'd combined with asap**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Asap is already places on the safety line.
- The ID is on the work line.
- At the moment that the ID is not used it should be placed in work position.
- The ascension is removed from the main line, neatly place foot loop around the ascension. Remember tripping hazard.
- Now calmly descend.
- With the asap it should be considered that the absorber is across his left arm. Remember the fall factor in case the main line breaks.
- Ensure that the asap is no longer in the "lock position".



## 13.6 Basic position

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Asap is already places on the safety line.
- The croll is on the work line.
- Ascension is on the main rope.
- Now place the descending equipment on the work line below the croll. Ensure that the descending equipment has been placed in work position.
- Ensure that the ascension is placed in such a way that it can be reached as soon as you are hanging in the descending equipment (possible ascending on ID/Rig)
- Remove the croll from the main line by opening the croll and closing it again at the same time.
- The ascension is removed from the main line, neatly place foot loop around the ascension. Remember tripping hazard.
- From this position descending can start, starting with short long rope exchange.
- Remember the asap.

## 13.7 Short rope exchange

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.

### 13.7.1 Ascending

- Asap is already places on the safety line.
- The croll is on the work line.
- Ascension is on the main rope.
- Now place the descending equipment on the work line below the croll. Ensure that the descending equipment has been placed in work position.
- Ensure that the asap is positioned high
- Ensure that the ascension is placed in such a way that it can be reached as soon as you are hanging in the descending equipment (possible ascending on ID/Rig)
- Remove the croll from the main line by opening the croll and closing it again at the same time.
- Now place the croll on the new work line.
- Now place the asap on the new safety line.
- Calmly descend till you hang straight below the anchor point of the new main line.
- Now the descending equipment can be removed.
- Remember the asap.
- Remember rope management.

### 13.7.2 Descending

- Place the descending equipment in work position
- Asap is already places on the safety line.
- Place the croll on the new work line.
- Place the asap on the new safety line.
- Calmly descend till you hang straight below the anchor point of the new main line.
- Now the descending equipment can be removed.
- Remember the asap.

### 13.8 Long rope exchange

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- With a long rope exchange it should be considered that an extra back-up equipment, asap, is used. This to prevent possible pendulum in case the line breaks.
- Asap is already places on the safety line.
- The croll is on the work line.
- New set of lines attached to the harness by using a carabiner/knot.
- At the start of the rope exchange the ascension is on the work line.
- Now place the descending equipment on the work line under the croll. Ensure that the descending equipment has been placed in work position.
- Ensure that the ascension is placed in such a way that it can be reached as soon as you are hanging in the descending equipment.
- The ascension is removed from the work line, neatly place foot loop around the ascension. Remember tripping hazard.
- Now place the croll on the new work line.
- Now place the second asap/353-2 on the new safety line.
- Depending on the depth and the amount available rope you can descend to the new position. Otherwise you will have to ascend/descend to the new position.
- During ascending and descending you can precisely determine where you will arrive. This is because of the mutual alignment of the ascending and descending equipment.
- Remember the asap in case of a pendulum.

### **13.9 Reelay < 1.5 metres**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- See short rope exchange

### **13.10 Reelay > 1.5 metres**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- With a long rope exchange it should be considered that an extra back-up equipment, asap, is used. This to prevent possible pendulum in case the line breaks.
- See long rope exchange

### **13.11 Passing knot**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Place asap on the safety line. Safety line is on the left side.
- Place the work line in the croll and close this.
- Place the ascension with foot loop above the croll on the main line.
- Remember screw-carabiner gravity loaded.
- Place your foot in the foot loop of the ascension.
- Push the ascension upwards and keep the work line between the legs.
- Remove possible slack from the line.
- Push yourself upwards and consider the slack that might occurs by pushing too fast or because of not enough rope mass.
- The rope will calmly mover through the croll
- In case of not enough rope mass it can be recommended to place both feet on the rope (remember dirt/grease etc. under the foot sole). This will ensure that the rope stays tight and there will be no slack in the beginning.
- Ensure that the shunt it taken along during ascending. Remember the fall factor in case of failure of the main robe. Ensure that the shunt remains above the shoulder
- When using the asap it is necessary that the absorber is on the left arm. Remember the fall factor in case of failure of the main rope.

### 13.11.1 Safety line

- When you have arrived at the knot in the back-up line there are two options to pass this, namely:
- When using an asap put the bowline in the carabiner and the second cow tail under the already placed asap (consider the fall factor). After a well-made knot remove the asap of the line and place this about the knot to be passed. Check the operation of the asap and remove the bowline from the second cow tail.
- When using a second asap place this above the knot to be passed and remove the asap from beneath the knot.

### 13.11.2 Work line

- When you have arrived at the knot in the main line, return to the basic position (place l'd under the croll and remove croll from the main line). Place the croll after the basic position above the knot to be passed and remove the l'd.

## 13.12 Aid Climb

### 13.12.1 horizontal

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Ascend with croll combined with asap to the beginning of the Aid Climb.
- Place 1 steel cable/profile clamp on the H-profile. Attached a cow tail to this steel cable, equipped with ascension with foot loop.
- Place a second steel cable on the H-profile and place a cow tail in this and attach your croll to this (remember the fall factor in croll, avoided with 2 steel cables/profile clamp).
- Place a third steel cable on the H-profile and attach your third cow tail to this and place a sangel in this.
- The first and third cow tail now have a sangel/foot loop. Stand in this and move yourself to the beginning of the work activities.

### 13.12.2 Vertical

Techniques to be performed are the same as the horizontal aid climb. Please consider the fall factor. In a horizontal aid climb there is a minimum fall factor. With a vertical aid climb there is the chance on fall factor 1 and higher.

### 13.13 Deviation

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Before one starts to ascend please ensure that there is a knot in both lines
- Ascend with croll/ld combined with asap to the beginning of the deviation.
- The deviation is equipped with 2 carabiners. The first carabiner is placed around the two lines.
- The second carabiner is placed under the croll/ld and asap
- Now remover the first carabiner from the two lines and let the line move controlled through the second carabiner till you hang directly under the anchor point.
- Continue to ascend
- When descending, reverse procedure.

### 13.14 Over the edge

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Move upwards till you have reached the edge.
- When the move has been realised with a croll, transform to the basic position.
- Transforming to the basic position, prevent a fall in the croll when exceeding the edge.
- Loosen the rope protector and place the asap above the rope protector and close this.
- Subsequently open the rope protector of the work line and continue to ascend.
- Ensure in case of a possible fall that the line falls on the rope protector, remember side loading.

### **13.15 Pull through**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Principle, aid climb
- Prior to aid climb you determine the height of the object and you prepare a rope bag with sufficient line for a double line descending.
- From the aid climb you will lower the end till it reaches the ground.
- Now make a bag knot in the line, move the line upwards, place this across the object whereby the end is moved through the loop of the bag knot.
- Before the line is completely moved through the loop of the bag knot a safety knot should be made in the end of the line.
- This treatment should be repeated for the second line (work line / safety line).
- Ensure that you use the correct line to descend.
- Leave the remaining line in the rope bag and calmly descend, don't throw it down!!!
- When arrived below remove safety knot and pull lines back.

### **13.16 Passing mid rope protection**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Move yourself upwards to below the rope protector
- Open the rope protector and move controlled upwards
- After passing the rope protector close this.
- Descend till above the rope protector
- Open the rope protector move controlled downwards
- After passing the rope protector close this.

# 14 Rescues

## 14.1.1 Rescue taking over descending equipment from above.

Starting position: casualty hangs in descending equipment combined with asap.

When a descender is not independently able with the use of a I'D and ASAP (unconscious or injured)

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- When a casualty is hanging in his descending equipment and asap and you cannot contact him anymore, blow your whistle 3 times and order your colleague to phone 112 (conform safety briefing and First Aid Protocol). Keep talking to the casualty during the whole process, he might hear you (reassurance).
- Ty the descending equipment/asap to the lines of the casualty.
- Descending equipment goes on the safety line of the casualty (if possible)
- Asap goes on the work line of the casualty.
- Descend with your descending equipment till you have reached the descending equipment of the casualty.
- Remember rope management.
- Attach a cow tail on the high/low attachment point on the harness of the casualty (depending on injury).
- Place your rescue set in the carabiner of the descending equipment and attach this to the high/low attachment point of the casualty.
- With an unconscious casualty you can place the rescue set on the high attachment point so it remains straight up.
- Pull the upper body of the casualty upwards. Make a connection between the chest part of the harness and the upper carabiner of the rescue set by using an extra carabiner (so the S.O. remains straight up).
- Casualty is now hanging on four contact points.
- Remove back-up equipment of the casualty
- Operate the descending equipment of the casualty and remove this of the line.
- Casualty is now hanging on two contact points.
- Use a deviation point to create extra friction.
- Remember gloves.
- Consider sharp/protruding parts during the descent.
- When arrived at the bottom leave the casualty strapped in and step out of the descending equipment yourself.
- Place the casualty in the taught position to prevent HST and wait for medical help.
- If necessary, apply First Aid.

### **14.1.2 Rescue taking over descending equipment from below.**

Starting position: casualty hangs in descending equipment combined with asap.

- When a casualty is hanging in his descending equipment and asap and you cannot contact him anymore, blow your whistle 3 times and order your colleague to phone 112 (conform safety briefing and First Aid Protocol). Keep talking to the casualty during the whole process, he might hear you (reassurance).
- Ty the descending equipment/asap to the lines of the casualty.
- Descending/ascending equipment goes on the safety line of the casualty (if possible)
- Asap goes on the work line of the casualty.
- Ascend with your ascending equipment till you have reached the height of the casualty.
- Remember rope management.
- Attach a cow tail on the high/low attachment point on the harness of the casualty (depending on injury).
- Place your rescue set in the carabiner of the descending equipment and attach this to the high/low attachment point of the casualty.
- With an unconscious casualty you can place the rescue set on the high attachment point so it remains straight up.
- Pull the upper body of the casualty upwards. Make a connection between the chest part of the harness and the upper carabiner of the rescue set by using an extra carabiner (so the S.O. remains straight up).
- Casualty is now hanging on four contact points.
- Remove back-up equipment of the casualty
- Operate the descending equipment of the casualty and remove this of the line.
- Casualty is now hanging on two contact points
- Use a deviation point to create extra friction.
- Remember gloves.
- Consider sharp/protruding parts during the descent.
- When arrived at the bottom leave the casualty strapped in and step out of the descending equipment yourself.
- Place the casualty in the taught position to prevent HST and wait for medical help.
- If necessary, apply First Aid.

Remember you can also use an external line set.



## **14.2 Rescue from croll**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Move yourself to the casualty.
- When you have arrived at the casualty attach a cow tail to the casualty as first point.
- Ascend further and ensure that you become in the basic position yourself.
- Place a rescue set in the carabiner of the l'd and attach this to the casualty, high/low binding point.
- Now place a sangel/foot loop above the croll
- Place a rope clamp above the croll of the casualty with a carabiner in the rope clamp.
- Now place the sangel/foot loop through the carabiner of the rope clamp and place your foot in the sangel/foot loop (possible expand with a sangel/etriers).
- Free the casualty by using "counter balance" and remove the croll by pushing the comb downwards.
- When the croll is removed from the line it will be closed immediately.
- Casualty is now hanging on the rescuer with two contact points.

## **14.3 Rescue from deviation**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Anticipate the situation, ensure for required material to reach the casualty.
- Before the rescuer moves towards the casualty he will make a knot at the bottom of the line that cannot go through the carabiner.
- The casualty is attached to the rescuer by using two contact point (remember deviation point)
- The rescuer descends with the casualty till the deviation.
- The rescuer takes the safety line and pulls this in till he reaches the deviation and places the second l'd on the safety line below the deviation.
- Now place asap op the main line above the deviation.
- Remove the l'd below the asap and place this below the deviation and remove the asap.
- Now descend by using "share loading" (no deviation point required).

## **14.4 Passing knot with casualty**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Anticipate the situation, ensure for required material to reach the casualty.
- Move yourself towards casualty.
- The casualty is attached to the rescuer by using two contact point (remember deviation point).
- The rescuer descends with the casualty till the knot.
- The rescuer will make a butterfly knot in the safety line including the knot to be passed.
- Now the rescuer places the l'd of the casualty on his own binding point (rescue set) and attaches these below the butterfly knot in the safety line.
- The rescuer can now remove his asap of the safety line.
- Ensure that the pressure is released from the work line in order to remove the l'd.
- Before the l'd is removed the rescuer first places a back-up.
- Now descend to the second knot and pass this by placing a second back-up.

## **14.5 Rescue from aid climb**

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Anticipate the situation, ensure for required material to reach the casualty.
- Move yourself towards the casualty. View contact points.
- You create a first and second contact point by attaching two grillions to the casualty and anchor point (Grillion is attached to the anchor point).
- Keep everything clear for yourself and move the casualty to a safe position by using the grillions.
- Descend using pull through. Casualty two contact points.

## 14.6 Rescue from short link

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Anticipate the situation, ensure for required material to reach the casualty.
- Move yourself towards the casualty. View contact points.
- You create the first point of the casualty by attaching a cow tail to a fixed point (sangel/steel noose/drill hook).
- In this cow's tail you attach the Id of the casualty and remove as much slack as possible.
- Now attach the sangel to the harness of the casualty by using an anchor knot and move this through the short link (do not use an extra carabiner to place the sangel).
- Depending on the length of the sangel there is the possibility to attached a sangel/etriers to the sangel with a carabiner to extent this.
- Before the casualty is freed the carabiner should be open.
- Now free the casualty by using "counter balance".
- Now the casualty is hanging on two contact point (first point ID/second point cow's tail).
- Now place a first attachment point with the casualty, use cow's tail of casualty.
- Now place a second attachment point, rescue set.
- Now remove all attachment points of the casualty and let the casualty gently enter the system by lowering his own l'd in the cow tail. Remove the cow tail and casualty is hanging on two points to the rescuer.
- Move yourself to a safe location.

## 14.7 Rescue from rebelay

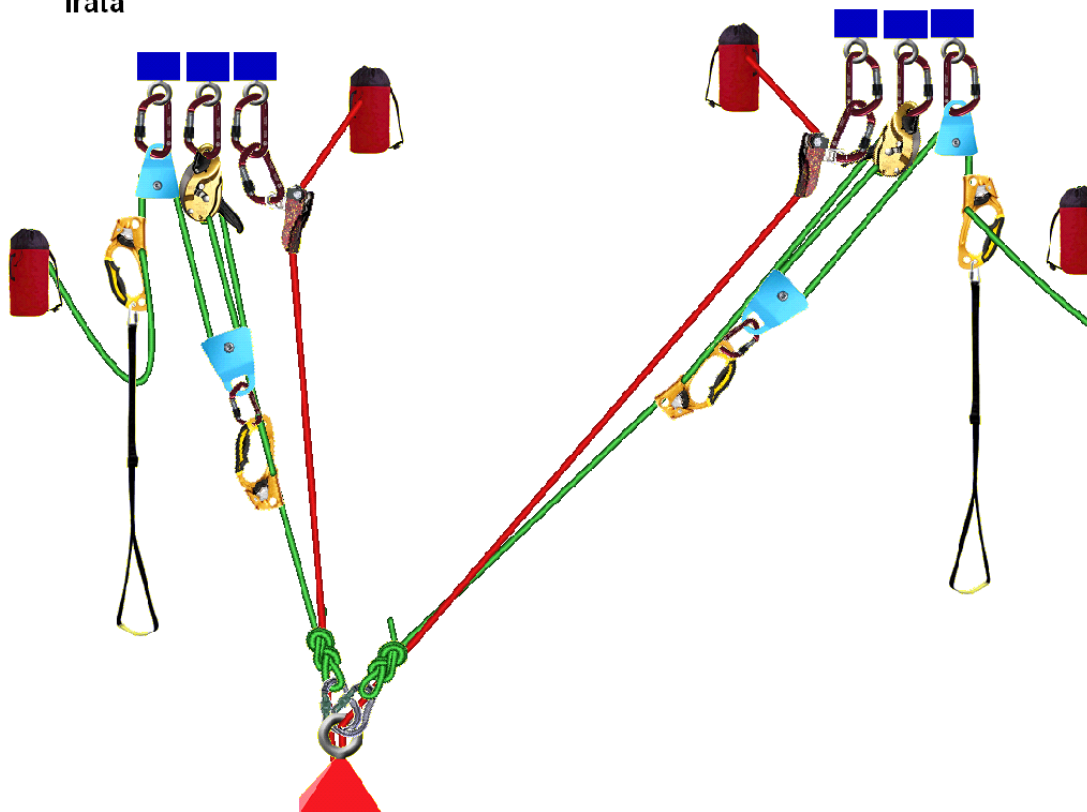
- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Anticipate the situation, ensure for required material to reach the casualty.
- Move yourself towards the casualty. Ensure that you are not in physical danger.
- The rescuer attached two carabiners on the way and places these in his own bottom binding point.
- Now the rescuer descends to the casualty and used the two carabiners as support.
- When arrived at the casualty, the rescuer will first place a cow tail and reverse the l'd of the casualty to replace the croll.
- Before the croll is actually removed (rescue from croll) the rescuer will attach his rescue set to the casualty. 4 contact points.
- The rescuer moves to a safe location. When arrived at the vertical lines the ID and back-up of the casualty will be removed.
- The rescuer descends further (remember deviation point).

## 14.8 Rescue cross haul

- All basic handlings regarding industrial climbing are performed with double lines. Please make sure that the student is continuously connected to two point.
- Prepare a rope bag for double line installation.
- Attach a l'd/asap to the line and put this in the rope bag.
- Install a force triangle and attach a rigger plate to this by using two carabiners.
- l's is attached in the rigger plate and put the work line in the l'd.
- Asap is attached in the rigger plate with an absorber side in the rigger plate.
- Asap is fitted from below.
- Attach both end of the line to the load.
- Consider a possible lifting system to lift the load upwards for the desired height.
- Repeat this for a second and possible third system.
- Load can be moved over 3 point with 2 people, remember pulleys and an extra l'd/asap.

### Cross haul for rescue

Irata





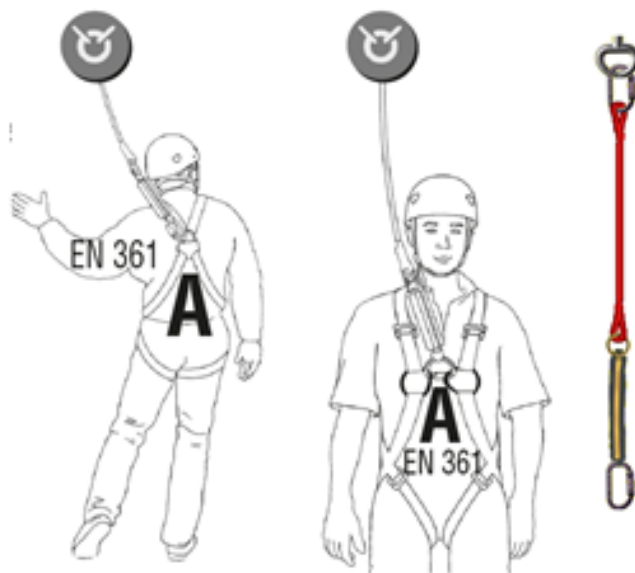
# 15 Climbing techniques

## 15.1 Fall protection

When there is actual danger of falling, fall protection is used. The main function of fall protection is to limit the force of the fall on the human body to below 6 kN. The parts of this system contain an anchor point, (attachment point) a life line, equipped with an energy absorber and a harness.

An energy absorber is strap material stitched together. As the stitches are ripped apart during the fall, the energy is absorbed and is not released on the body/anchor point.

Regardless the use of the energy absorber a fall factor 2 or higher should be avoided. Place the fall protection on the A point of the harness.



This is how you can use the MGO fall protection of a moving fall protection such as an asap, buddy (EN 353-2). Also remember a fixed process.

**Remember the hierarchy, fall protection is the final option!**

# 16 Definitions

For the purposes of these guidelines, the following definitions shall apply:

Aid Climbing fixed	Method of progression in suspension, either by moving from one point to another or by the use of moveable anchor points.
Anchor Place	Fixing or fixture to which a rope may be connected.
Anchor Line provide	Flexible line connected at least at one end to a reliable anchor to a means of support, restraint or other safeguard for a person wearing a harness in combination with other devices. An anchor line may be a working line or a safety line.
Ascender	A device which, when attached to a rope of appropriate diameter, will lock under load in one direction and slip freely in the opposite direction.
Back-up device	Rope adjustment device for a safety line of appropriate type and diameter which accompanies the user during changes of position or allows adjustment of the length of the safety line, and which locks automatically on the rope, or only allows gradual movement along it, when a sudden load is applied.
Belay	Place or places where either anchor lines or people may be anchored or secured.
Belay device	Device which, when attached, is auto locking when it is not used by the friction of a rope and slipping a rope when a handle is used.
Breaking Load	Minimum load at which an item of equipment breaks when it is tested, new, under specific conditions.
Body Support	Belt or harness.
Barrow Boy	A rescuer who is attached to a stretcher to assist the management of the casualty during a haul/lower.
Belayer	The person that manages the rope in such a way that he can arrest a fall should one occur.
Bight	A loop of rope which can be formed anywhere in the rope and can be any size. The start of many knots.
Bolts	Metal expansion or chemical bolts, which are placed in pre-drilled holes in the substrate for anchors, protection or aid.

Bowline	A knot commonly used in climbing for forming a loop in the end of a rope.
Certificate of Conformity	Documentation provided by a supplier of equipment at the time of purchase, stating performance specifications of the equipment or indicating performance to known standards or compliance with relevant legislation.
Competent Person	Designated person suitably trained or qualified by knowledge and practical experience to enable the required task or tasks to be carried out properly. By way of training and/or experience, a competent person is knowledgeable of applicable standards, is capable of identifying workplace hazards relating to the specific operation, and has the authority to correct them. Some standards add additional specific requirements which must be met by the competent person.
Connector	A device which may be opened, and is used to connect other components, which enables the user to link himself or herself directly or indirectly to an anchor.
Cow's Tail	Short dynamic stop, lanyard or sling connected to the main attachment point of a harness.
Descender	Manually operated, friction inducing, device, which when attached to a rope of appropriate type and diameter, allows the user to achieve a controlled descent and a stop with hands off anywhere on the anchor line.
Dynamic Rope	Rope specifically designed to absorb energy in a fall by stretching, thereby minimising the impact force.
Energy Absorber;	Component or components in a fall arrest system, designed to minimise the impact force generated in a fall.
Failure Load	See breaking load.
Fall Factor	Maximum distance a person could fall if held by the rope, divided by the length of the rope from the person to the anchor point.
Karabiner	Type of connector, formed as a complete loop, with a spring loaded entry gate often safeguarded in the closed position by a screwed ring ('screw gate karabiner') or automatic locking device (twist, tri, quad lock).



Kern mantel Rope	Textile rope consisting of a core enclosed by a sheath. (Note: the core is usually the main load bearing element and typically consists of parallel elements which have been drawn and turned together in a single or multiple layers, or of braided elements. The sheath is generally braided or woven, and protects the core from, for example, external abrasion and ultraviolet degradation.)
Lead Climbing	Method of progression, not in suspension, in which the operative is supported by the structure, and is protected by a safety rope, which is passed through intermediate anchor points.
Lifting Equipment	Work equipment for lifting or lowering loads, including its attachments used for anchoring, fixing or supporting it, e.g. chain or rope sling or similar, ring, link, hook, plate-clamp, shackle, swivel, eyebolt, webbing. Load also includes a person.
Proof Load Test	load applied to verify that an item of equipment will not exhibit permanent deformation under the load, at that particular time. The result can then be theoretically related to the performance of the equipment in its particular application.
Rope Access	Technique using rope, normally incorporating two separately secured systems, one as a means of access and the other as a back-up security, used with a harness in combination with other devices, for getting to and from the place of work and for work positioning.
Rope Adjustment Device	Generic term for components which, when fitted to an anchor line, will enable the user to vary their position along it.
Safe Working Load (SWL)	Designated maximum working load of an item of equipment under particular, specified conditions. See also Working Load Limit. (WLL)
Safety Line;	Safety rope or Backup line Anchor line provided as a safeguard. This is the rope used to protect against falls if the rope access operative slips or if the primary support (e.g. the working line), anchor or positioning mechanism fails.

#### Safety Method Statement;

**Method Statement** Document prepared by the employer describing how a particular job (or types of jobs where these will essentially be identical) should be undertaken to ensure that any risks to the health and safety of the workers, or others who may be affected, are minimised.

Screw link	Connector that is closed by a threaded sleeve which is a load bearing part of the connector when fully screwed up.
Sentry Person	Responsible for keeping watch to safeguard the anchorage areas and/or the area of ground below the operatives. Such a person should be a full member of the work team but need not be trained as a rope access operative.
Static Rope dynamic	Old term for rope with lower elongation characteristics than rope, superseded by the term 'low stretch rope'. Now only applies to ropes with negligible stretch, e.g. wire, Kevlar, which show little extension at failure and hence have little ability to absorb shock loads.
Supervisor;	Team Leader Person responsible for all aspects of a rope access site.
Suspended Scaffold	Scaffold suspended by means of ropes or chains and capable of being raised or lowered by such means but does not include a boatswain's chair or similar apparatus.
Working Line;	Working rope Anchor line used primarily for work positioning and restraint including ascending and descending.
Working Load Limit	Maximum load that can be lifted by an item under conditions specified by the manufacturer.
Work Positioning	Technique that enables a person to work supported in tension or suspension by personal protective equipment in such a way that a fall is prevented.
Work Seat	Suspended seat, not forming part of the safety system, provided for the comfort of a rope access operative.

# 17 Abbreviations

IRATA :	Industrial Rope Access Trade Association
ISO:	International Organization for Standardization
LOLER :	Lifting Operations and Lifting Equipment Regulations 1998
COSHH :	Control of Substances Hazardous to Health
ARBO:	Arbeids Omstandigheden (Arbeids omstandigheden wet = like labor law)
SHE/ HSEQ :	Safety, Health and Environmental / Health, Safety, Environmental and Quality
NEN :	Nederlandse Normalisatie Instituut
NEN-EN :	Nederlandse Normalisatie Instituut Euro Norm
BS :	British Standard
BS EN :	British Standard Euro Norm
PrEN :	Proposed Euro Norm
DIN :	Deutsche Industrie Norm
PPE :	Personal Protective Equipment
RAT :	Rope Access Technician (occasionally Team)
VCA	Veiligheid Checklist voor Aannemers

# 18 References

- *EU Guideline 2001/45/EG*
- *The new Work at Height Regulations 2005 (S.I.2005 No 735)*
- *IRATA TACS*
- *IRATA International Code of practice- on the use of rope access methods for industrial purposes*
- *Lifting Operations and Lifting Equipment Regulations (LOLER)*
- *Artikel 3.16, Arbobesluit, Voorkomen valgevaar.*
- *Arbobesluit artikel 7.23 Arbeidsmiddelen voor tijdelijke werkzaamheden op hoogte (zie Staatsblad der Nederlanden no. 2004/279).*
- *Artikel 7.2, Arbobesluit, Arbeidsmiddelen met een CE-markering.*