

**JUMPS WITH ROPE
FROM HIGH-RISE OBJECTS
(ROPE-JUMPING)
SAFETY RULES**

Zaporozhje

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Recommended by the public organization «International Rope-Jumping Federation» as Regulations on the organization of jumps using rope (rope-jumping).

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INTRODUCTION

Jumps using rope from high-rise buildings are potentially dangerous type of extreme activity. The key to your safety is to observe these Rules strictly paying attention to the environment around you and to the people.

Please find time for careful studying this safety matter. If you have any doubts and difficulties in understanding the material set forth below, contact the representatives of the International Rope-Jumping Federation.

Information provided in the Rules can not replace the experience of practical use of the equipment intended to perform jumps, and that is the key factor – use the equipment for its intended purpose, such as ascending mountains, speleological expeditions, rock climbing and industrial high rise works. Please also note that the ability to use the equipment for the listed activities does not allow jumping without special training and subsequent certification as a Rope-jumping instructor!

Thereby it is your responsibility to obtain skills in organizing safe jumps. In addition, we can not guarantee that information contained in the Regulations is comprehensive and understandable to everyone. The International Rope-Jumping Federation reserves the right to amend the information provided.

ATTENTION!

We strongly recommend not practicing jumps using ropes from bridges, rocks and other high-rise objects without corresponding special training or without guidance of an instructor trained and certified by the International Rope-Jumping Federation!

1. TERMS, DEFINITIONS AND ABBREVIATIONS

- 1.1. **International Federation** - Public organization «International Rope-Jumping Federation».
- 1.2. **Jumps with a rope (rope-jumping)** - a jump and further free fall from high-rise building, which is stopped using specially hitched rope system.
- 1.3. **Facility layout** - approved procedure for hitching ropes and other belay items to perform jumps from the particular object.
- 1.4. **Organizer** - participant, engaged in the provision of jumps, trained and certified as an instructor in rope jumping.
- 1.5. **Participant** - a person doing jumps, undergone corresponding training and instruction.
- 1.6. **Exit** - prepared site or special structure, from which the jump is executed.
- 1.7. **Exit height** - vertical distance from the exit edge to the earth surface, water, structure or obstacles.
- 1.8. **Thick rope (TR)** - static or dynamic rope used as safety equipment during jumping or moving over terrain.
- 1.9. **Safety rope** - the rope designed to prevent man fall.
- 1.10. **Auxiliary rope** - the rope designed to carry out tasks not related with protection and movement of a person on rope.
- 1.11. **Hitch** - thick rope attached to the terrain in a special manner using technical means designed to protect man during a jump or moving over terrain. Hitch may be **experimental**, which is used at new facility, and **permanent** - for open educational and training activities.
- 1.12. **Hitch vertical section** - part of the hitch, which goes mostly upright and designed for ascending-descending a person.
- 1.13. **Hitch horizontal section (fixed rope)** - part of the hitch, which goes mostly horizontal and intended for horizontal motion of people.
- 1.14. **Double fixed rope** - horizontal part of the hitch (fixed rope), formed with two thick ropes, all passing points of anchoring are replaced with base points of anchoring.
- 1.15. **Dual fixed rope** - horizontal part of the hitch (fixed rope), doubled with the second thick rope.
- 1.16. **Individual set** - a set of equipment required for the safe jump or movement of people using fixed rope.
- 1.17. **Point support** – means attaching thick rope to the terrain.
- 1.18. **Point of anchoring** – place of thick rope attachment to the terrain using point supports.
- 1.19. **Pulley** - a system designed to increase driving force applied to the rope.
- 1.20. **Safe zone** - a place where a person being without belay can not fall deeper than his location.
- 1.21. **Karem** - a slack rope formed by the hitch part coming from the top and passing point of anchoring (base point of anchoring) needed for the convenient overcoming the passing point of anchoring (base point of anchoring).
- 1.22. **Rebelay:**
- 1) General. The process of overcoming a passing point of anchoring (base point of anchoring), a knot on a rope, protector, deflector and hitch element connectors.
 - 2) Particular. Transferring line-to-hitch attachment from one hitch element to another one.
- 1.23. **Hitch technical element** – hitch part provided for the purpose of safe and comfortable movement of people and requiring special man overcoming technique. Hitch technical elements

include: base point of anchoring (BPA), passing point of anchoring (PPA), hitch vertical section, fixed rope, deflector, protector, knots.

- 1.24. **Fall factor** - measure of the belay system relative load in case of fall. Defined as the ratio of the fall height to the rope length used to stop fall. It can take values from 0 to 2.
- 1.25. **Personal protection** - items and equipment needed to provide health and safety of every person with regard to effect of harmful and dangerous factors (goggles, gloves, belay systems, etc.).
- 1.26. **Event Schedule** - a detailed event schedule indicating: the persons responsible for the activity, technical and organizational issues, dates and venues. It is developed and approved by persons appointed by the order issued in the organization.
- 1.27. **List of abbreviations:**

TR – thick rope

CC – central connector

DSC – descender

MMPS – man-made point support

NPS – natural point support

PPA – passing point of anchoring

BPA – base point of anchoring

LL – local loop

NS – natural support

2. GENERAL REQUIREMENTS

- 2.1. Jumps with rope can be fulfilled as training or independent demonstrative or as part of other one-day or multi-day event closed or open.
- 2.2. The event is agreed with all the organizations in which it is conducted, or which scope of activities covers the event. The event does not contradict laws of the country in which it is held, does not violate the rules of public order, interfere with the transport, interfere with the operation of facilities where and near which it is held.
- 2.3. Both members of the International Federation, and everyone are allowed to participate in the event if they are in compliance with the following:
 - Age of 18 and higher,
 - No medical contraindications,
 - Not being under drugs or alcohol intoxication,
 - Carefully read these requirements and all necessary rules and regulations, understood and agreed to comply.
- 2.4. Notify the owner of the object and rescue service in charge of the area about the date and time of the event.
- 2.5. Time and date of the beginning and end of the event, distribution of organizers over job places at the site and leader of jumping are determined by the event schedule.
- 2.6. Safety of permanent hitches, which is used during open training activities, is confirmed by calculations and tests. The results of calculations and tests are documented, agreed and approved by the experts and organizations that are entitled to do this.
- 2.7. Self-participation in organizing jumps is allowed for the International Federation members not younger than 18 years that have passed medical examination and have no contraindications to arrange at high altitudes, have passed induction training, certified as a rope-jumping instructor, having the experience of participating in the jump events for at least one year.
- 2.8. Qualifications allow the organizer to be able to work safely with the equipment used, if necessary, to carry out rescue operations, provide first aid to victims. The facility is equipped with sufficient amount of equipment, medicines, means of transport and communications to provide first aid and transportation to a medical facility.
- 2.9. Qualifications of each organizer are confirmed by the relevant certificate of the rope-jumping instructor of the appropriate category (which depends on the complexity of the object).
- 2.10. All participants are insured.
- 2.11. All organizers are required to know and follow the rules of radio communications.
- 2.12. Persons accepted for the first time to organize jumps within one year work under the direct supervision of trained organizers, assigned by the order (decree) in the organization.
- 2.13. A member of the International Federation admitted to organizing the event is obliged to:
 - Perform only the work that is defined by the event schedule.
 - Properly apply and use the equipment, individual and collective.
 - Immediately notify the leader of jumps about any situation that threatens life and health of people, about deterioration of his health.

- Undergo training in safe methods and techniques of working with the equipment and provision of first aid, coaching and examination of knowledge with regard to the requirements of these Regulations.
 - Undergo mandatory periodic medical examinations (surveys), and undergoes extraordinary medical examinations (surveys) by the decision of the governing bodies of the public organization.
 - Be able to provide first aid in case of accidents.
 - Have a valid rope-jumping instructor certificate corresponding to the object category.
- 2.14. When carrying out these activities account the following possible impact of hazardous and harmful factors:
- the venue location at a considerable height with respect to the ground (rocky terrain, water) and resulting possible fall of man or drop objects on a person;
 - collapsing structure (extended platforms, stages, railings, fixing points, ropes and other equipment);
 - high slip (due to icing, moistening, oil covering the soil surface, platforms, stages, rocky terrain, and so on);
 - ice formation on ropes and equipment;
 - moving machines, equipment and parts of equipment;
 - higher wind speed;
 - higher or lower air temperature;
 - sharp edges, burrs and roughness on the surfaces of tools and equipment;
 - lack of light at jumps venue;
 - physical overloads.
- 2.15. To protect from dangerous and harmful factors a participant of the event is provided with a sufficient number of individual and collective special equipment (personal protection equipment).
- 2.16. During event use only serviceable equipment and communications means, protective equipment. It is forbidden to hold the event with defective (not undergone tests, checks, control) equipment.
- 2.17. The event outside the premises is forbidden under the following conditions:
- during thunderstorm;
 - when the outdoor temperature is below the norm established by the equipment manufacturers;
 - if the wind speed equals to 8 m / sec and more;
 - in heavy snowfall or fog (visibility is less than 50 m);
 - in icy conditions.
- 2.18. In case of injury or sickness of a participant stop the event until deciding on further action, notify the leader of jumps, if necessary, contact the medical institution.
- 2.19. The event is provided with sufficient number of the first aid kits in accordance with the event schedule.
- 2.20. Venue of the event and all of its potentially dangerous areas are marked with warning signs.
- 2.21. For failure to comply with these instructions guilty persons are removed from the event, even with the exclusion of members of the International Federation.

3. REQUIREMENTS TO HEALTH DURING JUMPS

- 3.1. Medical contraindications for jumping and flying on a rope:
 - 3.1.1. Musculoskeletal system: spinal injury in the past, surgery on the spine, herniated discs, scoliosis 3-rd grade, congenital malformations of the spine.
 - 3.1.2. Cardiovascular system: congenital and acquired malformations of the heart pacemaker, cardiac arrhythmias, hypertension, hypertension 2-3 stages, heart failure.
 - 3.1.3. Respiratory system: asthma of mixed genesis.
 - 3.1.4. Early postoperative period: the first 1,5-2 months after surgery.
 - 3.1.5. Strong myopia, laser vision correction.
 - 3.1.6. Increased intracranial pressure, epilepsy.
 - 3.1.7. Thyrotoxicosis.
 - 3.1.8. Pregnancy.
 - 3.1.9. Falling of the kidneys of the 2nd-3rd stage.
 - 3.1.10. Psychiatric disease in acute schizophrenia, MDS, etc. Chronic mental illness and related conditions.
 - 3.1.11. Severe nerve damage, chronic recurrent disease of the peripheral nervous system and the residual effects of an illness or injury of large nerve trunks with persistent movement disorders, sensitivity and trophism.
 - 3.1.12. Alcoholism, drug addiction, substance abuse.
 - 3.1.13. Stay under the influence of alcohol or drugs.
 - 3.1.14. Medical conditions that may adversely affect the attentiveness, concentration, coordination of movements.
 - 3.1.15. Hidden diseases and their consequences, which could affect the ability to make a jump, and that can lead to worse health or injury before, during or after the jump.

4. RULES OF RADIO COMMUNICATIONS

- 4.1. During events use only permitted radio transmitters (radio stations) complying with Laws concerning usage of radio-frequency resources of the country, where they are held.
- 4.2. Number of stations and their location on job sites are defined in the event schedule.
- 4.3. Location of radio stations on the ground allows them to maintain permanent and high-quality mutual connection.
- 4.4. Wavelength working range is defined at the venue and before beginning of the event. Unauthorized users and other interference are not permitted to be within this range.
- 4.5. Wavelength working range is changed during the event only by agreement with the leader of the event.
- 4.6. The activity is suspended at the time of changing the working wavelength range and till establishing communication with all participants using new range.
- 4.7. All radio stations are turned on permanently from the beginning to the end of the event.
- 4.8. Be sure that exit instructor, instructor at the receiving area and every point of the rope layout involved in its preparation to jump are equipped with two-way radios. The call signs of radio stations are assigned according to this layout.

4.9. Exit instructor gets information about readiness of all parts of the layout and all participants. For that he has to know it thoroughly.

4.10. Prior to receiving the affirmative answers from all participants by the exit instructor the layout is considered not ready to jumps.

4.11. Sending commands and setting tasks via the radio is executed in the following order:

- call sign of the called radio station - twice (with a good quality of communication - once);
- the word "I" and call sign of own radio station – once;
- signal (command) - twice (task, and command under good quality of communication - once);
- the word "over" – once.

For example - "Exit I am Base, belay is ready, OVER." The phrase is pronounced till getting response "Base, I am Exit, understood – belay is ready, OVER."

4.12. If necessary under difficulty hearing due to wind or other weather conditions use "hands-free" set.

4.13. If necessary to transfer the extra information begin a sentence with double repetition of the word "ATTENTION", after that say the information in the manner described in para. 3.11.

For example - "ATTENTION, ATTENTION, exit, I am stop, I see a person below the jump site, jump forbidden, OVER." Repeat phrase with emergency information until getting the response from whom it is addressed.

4.14. Extraneous talks in the air during the event are forbidden. Because they can interfere with the timely and accurate transmission of information affecting safety of the event.

5. EQUIPMENT¹

5.1. Equipment used to perform hitching.

5.1.1. **Thick Rope (hereinafter TR)** – static or dynamic rope intended to provide safety of a person while jumping or when moving over terrain.

5.1.2. Requirements to the Rope:

5.1.2.1. A rope is designed to ensure safety of people.

5.1.2.2. A rope complies with:

- EN 1891 / UIAA 107 for static rope;
- EN 892 / UIAA 101 for dynamic rope.

5.1.2.3. A rope has a certificate of conformity (quality) of one of the above standards.

5.1.2.4. A rope diameter is at least 10 mm.

5.1.2.5. A rope diameter conforms to the performance characteristics of equipment used.

5.1.2.6. Operate and maintain the rope in accordance with regulations established by the manufacturer and indicated in the data sheet.

5.1.2.7. Basic requirements for operation, storage and recommended limits of breaking load are specified in Appendix 1.

5.1.2.8. When found defects (fault) of the rope act in accordance with Appendix 2.

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011.

5.1.3. Connectors.

- 5.1.3.1. **Carabiner** — releasable connector with the closing contour.
- 5.1.3.2. **Quicklink** – releasable screwed-closure connector.
- 5.1.3.3. **Lock** – part of the connector, which provides: in carabiners - latch protection against inadvertent opening; in quicklinks – contour closing.

5.1.4. Requirements to Connectors.

- 5.1.4.1. A carabiner is designed to ensure safety of people.
- 5.1.4.2. A carabiner meets one of the standards listed below:
 - EN 362 class B,
 - EN 12275 / UIAA 121 class B, H,
- 5.1.4.3. A quicklink meets one of the standards listed below:
 - EN 362 class Q,
 - EN 12275 / UIAA 121 class Q,
- 5.1.4.4. A connector has quality certificate confirming compliance of the products with specified standards.
- 5.1.4.5. Mark of conformity to the standard and basic strength characteristics, such as longitudinal load, lateral load and longitudinal load with open contour are applied to the carabiner body along its main axis.
- 5.1.4.6. Mark of conformity to the standard and basic strength characteristics, such as longitudinal and lateral loads are applied to the quicklink body along its main axis.
- 5.1.4.7. Operate and store connectors in accordance with regulations established by the manufacturer and indicated in the data sheet.
- 5.1.4.8. Do not modify the connector so to reduce its strength characteristics.
- 5.1.4.9. When found defects (fault) of the connector act in accordance with Appendix 3.

5.1.5. Man-Made Point Supports.

- 5.1.5.1. All the following requirements are applicable to a point support; they are based on the principle of self wedging-out or adhesive point support.
- 5.1.5.2. All man-made point supports (MMPS) are made of stainless steel.
- 5.1.5.3. Observe the MMPS installation technology specified by the manufacturer.
- 5.1.5.4. Recommended distance between MMPSs – at least 20 cm.

5.1.6. Requirements Applicable to MMPS.

- 5.1.6.1. Sleeve length is at least 100 mm, sleeve outer diameter - 12 mm, sleeve inner diameter - for stud M10.
- 5.1.6.2. Nut is marked with «A» or «8.8».

5.1.7. Requirements Applicable to Adhesive Point Support

- 5.1.7.1. Diameter, hole depth, amount of adhesive are indicated by the manufacturer.
- 5.1.7.2. MMPS breaking load is not less than 25kN.

5.1.8. Requirements Applicable to Lugs.

- 5.1.8.1. It is recommended to use lugs made of stainless steel or duralumin alloys.
- 5.1.8.2. Lug withstands the ultimate tensile load of at least 15kN.
- 5.1.8.3. The manufacturer and breaking load are indicated on the lug body.
- 5.1.8.4. The lug load application direction is specified by the manufacturer.
- 5.1.8.5. A lug is fitted with a nut in accordance with the manufacturer's requirements. When found defects (faults) of lugs act in accordance with Appendix 9.

5.1.9. Local Loops.

- 5.1.9.1. **Local loop** is a static rope (steel cable, tested sling), designed to create a point support using natural support. A local loop is made of TR with a diameter of 10 mm, wire rope of 6 mm and tested sling, which withstands static load of at least 1500 kg.

5.1.10. Requirements for Slings sewn into Ring.

- 5.1.10.1. A sling withstands static load of at least 22 kN and has a quality certificate confirming compliance of the products with the above requirements.
- 5.1.10.2. Slings of European manufacturers comply with EN 566.
- 5.1.10.3. A sling has a label indicating breaking load limit, product name, company and country of origin. Slings of European manufacturers also have a sign of conformity to EN 566 and CE mark certificate with the number of laboratory.

5.1.11. Requirements for Single Slings.

- 5.1.11.1. A sling withstands static load of at least 15 kN and has a quality certificate confirming compliance of the products with the above requirements.
- 5.1.11.2. Slings of European manufacturers also have a sign of conformity to EN 566 and CE mark certificate.

5.1.12. Deflector.

- 5.1.12.1. Deflector – a hitch element changing the rope direction. It may consist of: a man-made point support (natural point support), a connector (quicklink, carabiner, knot), extension element (TR, tested sling) and the second connector (carabiner with lock). If the deflector is used for the base rope, it is always attached to it by means of a pulley supported with carabiner having a lock.
- 5.1.12.2. It is recommended to make an extension element of TR with diameter of 10 mm or tested sling withstanding a static load of at least 15 kN.
- 5.1.12.3. See requirements to slings in para 1.1.4.
- 5.1.12.4. See requirements to connectors in para 1.1.2.
- 5.1.12.5. See requirements to thick rope in para 1.1.1.
- 5.1.12.6. See requirements to pulley in para 5.2.18.

5.1.13. Protector.

- 5.1.13.1. **Protector** is an element designed to protect the rope from friction against terrain or other movable parts of hitch. The protector is placed in TR-to-terrain points of contact and is used when it is impossible to avoid friction against terrain by other means (passing point of anchoring, deflector). Also, the protector is used in places where friction of the rope against the terrain or relative motion of the ropes against each other is theoretically possible.

5.1.14. Requirements to Protector.

- 5.1.14.1. Protector:
- is made from abrasion resistant materials;
 - protects the rope (prevents accidental protector opening or renewal of the rope friction on terrain);
 - can be easily removed with a rope.

5.2. Equipment to Perform Jumps (personal equipment).

5.2.1. **Individual Set** - a set of equipment necessary for the man safe jumping or moving people over terrain.

5.2.2. **Individual set of a person** consists of mandatory elements:

- lower harness (seat harness) and chest harness, interconnected by thick rope, helmet

or;

- lower harness (seat harness) and (or) full-body harness, interconnected by thick rope or sling sewn in a ring, helmet.

5.2.3. **It is strictly forbidden** to use rope wrapping or double cord for interconnection of seat harness and chest harness as under dynamic load the rope wrapping withstands maximum 170 kg. It is also unacceptable to use carabiner for connecting loops of chest harness and seat harness.

5.2.4. **Individual set of an instructor** consists of the following:

- mandatory elements: seat harness, two lanyards with carabiners with lock for connection to safety fixed rope;
- auxiliary elements: ascending device, belay device, service carabiner, pulley and carabiner, helmet (in case of staying even for short period within the stone-hazard area)

5.2.5. **Location of Equipment on a Person:**

5.2.5.1. Harnesses are put on a person and interconnected with each other (if there are two harnesses).

5.2.5.2. Harnesses sit tight enough not to cause discomfort and pain while jumping.

5.2.5.3. Lanyards are knotted to the harness cargo loops according to the manufacturer's recommendations.

5.2.5.4. Belt buckles are locked to prevent inadvertent run out of belts.

5.2.5.5. Helmet fixing is tailored to the individual size, helmet is put on the head, fastening strap is tight and clasped.

5.2.5.6. Harness load-bearing flaps of jumping person are free of equipment, all loose ends of harness hanging slings are gathered and fixed.

5.2.5.7. Additional equipment on the instructor harness is put on the harness load-bearing flaps or in the working position, as recommended by the manufacturer of the equipment and harness. Location of equipment does not prevent jumping.

5.2.6. **Harness (belay system)** - equipment item that a person puts on himself, and to which thick rope is attached by means of carabiner or knot. Belay system is used to distribute forces when rope jerks due to fall over a large area and to prevent human injury.

5.2.7. **Lower harness (seat harness)** - consists of interconnected belt and leg loops.

5.2.8.5.2.10. **Chest harness** - consists of wide power belts, covering the chest of a man and fixing the system position on the shoulders.

5.2.9. **Full-body harness (combined)** - consists of a waist, leg and shoulder loops.

5.2.10. **Bandages** - consist of power belts firmly tighten on the shin.

5.2.11. **Harness cargo loops** - an element of the belay system, which is designed by the manufacturer of the system for attaching a man to thick rope. Proper and safe variants of cargo loops usage are indicated in the documentation for the belay system.

5.2.12. Requirements to Harness.

5.2.12.1. Harness is designed to ensure safety of people.

5.2.12.2. Harness meets one of the standards listed below.

- EN 12277 / UIAA105,
 - EN 813, EN363, EN361, EN358,
- 5.2.12.3. Harness has a certificate of conformity (quality) proving its compliance with one of the above standards.
- 5.2.12.4. Harness has a label indicating product name, company and country of origin. Harnesses of European manufacturers also have a sign of conformity to EN standard and CE mark certificate with the number of laboratory.
- 5.2.12.5. Do not modify the harness so to reduce its strength characteristics.
- 5.2.12.6. Harness is provided with cargo loops (deadeyes) for connection to TR.
- 5.2.12.7. Operate and store harnesses in accordance with regulations established by the manufacturer and indicated in the data sheet.
- 5.2.12.8. When found defects (fault) of the harness act in accordance with Appendix 4.
- 5.2.13. **Ascending device**
- 5.2.13.1. **Ascending device** is a device for climbing the rope.
- 5.2.13.2. **Leading ascending device** – an ascending device used for supporting a person in the process of making a step on the rope (movable by arms).
- 5.2.13.3. **Fixing ascending device** – an ascending device holding the person in a static position on the rope.
- 5.2.14. Requirements to ascending devices
- 5.2.14.1. An ascending device is designed to ensure safety of people.
- 5.2.14.2. An ascending device meets one of the standards listed below:
- EN 567/UIAA126,
 - TY 9616-006-42780816-08 (Vento).
- 5.2.14.3. An ascending device has quality certificate confirming compliance of the products with specified standards.
- 5.2.14.4. Name of the manufacturer, mark of conformity to the standard, working diameter of ropes is applied on the ascending device body by the manufacturer.
- 5.2.14.5. Operate and store ascending devices in accordance with regulations established by the manufacturer and indicated in the data sheet.
- 5.2.14.6. Do not modify the ascending device so to reduce its strength characteristics.
- 5.2.14.7. An ascending device mounted on the rope withstands a static load of at least 4 kN without deformation of the rope wrapping.
- 5.2.14.8. When found defects (fault) of the ascending device act in accordance with Appendix 7.
- 5.2.15. **Lanyards.**
- 5.2.16. **Lanyard** is an element of personal equipment, designed for comfortable maneuvering when man goes with safety fixed rope and for prevention of man incidence in case of fall.
- 5.2.16.1. A lanyard consists of an extension element of certain length and carabiner.
- 5.2.16.2. Carabiners meet the requirements for connectors given in para.5.1.4.
- 5.2.16.3. The following is used as an extension element:
- dynamic rope with a diameter of at least 9 mm;
 - static rope with a diameter of at least 9 mm;
 - sling sewn into the ring;
 - single sling knotted into the ring by means of ribbon knot
- 5.2.16.4. An extension element:

- made of thick rope complies with the requirements of para 5.1.2.
 - made of sling sewn into the ring complies with the requirements of para. 5.1.10.
 - made of sling knotted into the ring by means of ribbon knot - single sling complies with the requirements of para. 5.1.11.
- 5.2.16.5. An extension element made of rope with sewn slings (deadeyes) without knots complies with the requirements of para 5.1.10 «Requirements to Slings Sewn into a Ring».
- 5.2.16.6. When found defects (faults) of the extension element act in accordance with Appendices 2 and 10.
- 5.2.16.7. When making lanyards from a rope use the figure-eight knot.
- 5.2.16.8. Straighten and tighten the knots with a force equal to the weight of the person. The remaining part of the rope exiting the knot must be at least 7 cm.
- 5.2.16.9. It is allowed to use two lanyards having common loop (knot) anchoring them to the harness cargo loops. These lanyards are considered as two independent lines of anchoring.
- 5.2.16.10. The following types of lanyards are distinguished:
- Lanyard to leading ascending device,
 - Lanyard (two lanyards with common knot) for motion using safety fixed rope.
- 5.2.16.11. Lanyard to Leading Ascending Device.**
- 5.2.16.12. The lanyard length to the leading ascending device is individual for each person and is defined as follows. Starting position – lanyard by its one end is attached to the harness cargo loops, and by the second end - to the leading ascending device. Man is in hanging position at the leading ascending device. From this position he can easy reach out his hand and take the leading ascending device body.
- 5.2.16.13. Lanyard is connected to the leading ascending device with harness cargo loops as follows:
- Fixed with eight-figure knot, a loop,
 - attached by means of a screwed-closure connector having diameter of at least 7 mm, with lock tighten with wrench.
- 5.2.16.14. Lanyard-to-leading ascending device connection:
- By means of screwed-closure connector having diameter of at least 7 mm,
 - By means of carabiner with lock.
- 5.2.16.15. Lanyards for Moving on Hitch.**
- 5.2.16.16. One of lanyards for moving over hitch meets the standards listed below.
- 5.2.16.17. Lanyard standard length: -40 ± 1 cm («short lanyard») or 65 ± 1 cm («long lanyard») accounting all connectors.
- 5.2.16.18. Lanyard-to-harness cargo loops connection is made as follows:
- By means of a knot;
 - By means of a connector – a quicklink having diameter of at least 7 mm.
- 5.2.16.19. Lanyards are connected to fixed ropes by means of carabiners with lock.

5.2.17. Belay device

- 5.2.17.1. **Belay device** – a device intended to descend man on the rope, as well as to provide safety with the help of climbing equipment. Use friction descenders not allowing rope twisting while decelerating friction functionally similar to the Stop, GriGri, Reverso models of the Petzl company.
- 5.2.17.2. Requirements to descenders:

- Descender is designed to descend a man on a rope.
- Operate and store descenders in accordance with regulations established by the manufacturer and indicated in the data sheet.
- Descender is designed to withstand working load of at least 1,5 kN.
- Descender is designed to withstand static load of at least 1,2 kN.
- When descending using descender the rope does not twist.
- Descender structure excludes friction of carabiner connecting descender and harness cargo loops over rope while descending.
- Carabiner connecting descender and harness cargo loops meets requirements described in para 5.1.4.
- For connection use carabiners with threaded lock or automatic lock only recommended by manufacturer.
- It is forbidden to use automatic carabiners without lock rotary mechanism corresponding to EN 362, class K (type Vertigo of the Petzl company and similar ones).

5.2.18. Pulley.

5.2.18.1. **Pulley** – a simple mechanical device designed to reduce friction of a rope sliding through a carabiner.

5.2.18.2. Requirements to pulleys.

5.2.18.3. Pulley meets one of the standards listed below:

- EN 12278/UIAA 127.
- Pulley has a certificate of conformity (quality) proving its compliance with one of the above standards.
- Mark of conformity to the standard, longitudinal load, name of the manufacturer and working diameter of ropes are applied on the pulley body along its main axis.
- Operate and store pulleys in accordance with regulations established by the manufacturer and indicated in the data sheet.
- Pulley withstands working load of at least 4 kN and limit load of at least 16 kN.
- Do not modify the pulley so to reduce its strength characteristics.
- When found defects (fault) of the pulley act in accordance with Appendix 8.
- It is recommended to use pulley on the base of rolling bearing to increase performance efficiency.

6. HITCH¹

6.1. Hitching.

6.2. **Hitching** is a complex of works on fastening a thick rope on a terrain, directed on creation of conditions for safe jumps.

6.2.1. The hitch must correspond to the following principles:

6.2.2. Safety:

- Elimination of friction on the terrain. Mount the hitch so that at all phases of its work the thick rope does not contact the terrain;

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011.

- The detour of sites where stones fall. Mount the hitch so that to exclude probability of falling stones on people and equipment. It is reached at the expense of preliminary clearing of a place for jumping from stones, other extraneous subjects and diversity of adjacent vertical sites of the hitch on which the people will be.
- Elimination of friction on the terrain, the avoidance of the sites where stones fall is carried out by a reasonable combination of hitch technical elements, and also careful people movement on a hitch and fixed ropes.
- Duplication of all elements. Fasten the hitch so that at full or partial failure of any element another element functions instead.
- Elimination of excessive load on the jumper. The maximum short-term loading applied to leash-to-person point of attachment should not exceed 600 kg. Check actual loading for each new object.
- Exception of excessive loads on hitch points of attachment and its elements. While hitching check up the actual loads applied to all its elements, they must exceed the halves of those that these elements withstand according to the manufacturer's data.
- Provision of a safe trajectory of falling down. At all phases of a jump a person is at the safe distance from parts and surfaces of the terrain, building structures and any other objects getting into a flight trajectory.
- Provision of safe depth of falling down. The bottom point of braking is at a safe distance from the earth surface, the water surface, the treetops, the crags.
- Provision of altitude margin. The bottom point of braking is at distance (in vertical direction) equal to not less than 10 % of exit height from the nearest obstacle, when using only one hitch contour, which provides a safe hitch work if any of its parts fails.

6.2.3. Comfort (convenience)

- All phases of a jump, braking and pick-up, and also the person hanging on must not cause discomfort and painful feelings;
- The convenient access, leaving from a place of jumps does not demand the raised expenditures of labour;
- The hitch standardization is a typical kind of each hitch technical element.

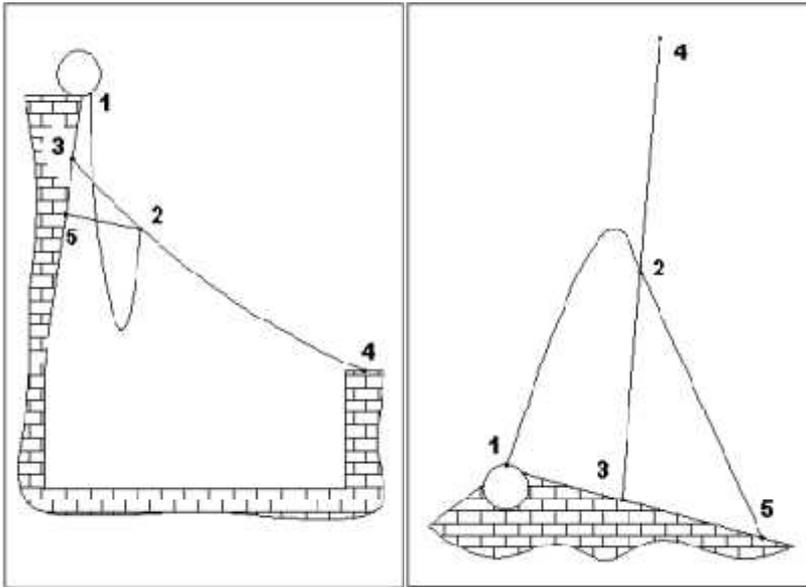
6.2.4. Rationality

- Economy of equipment while hitching;
- The optimization of labour efforts and time expenses while hitching.

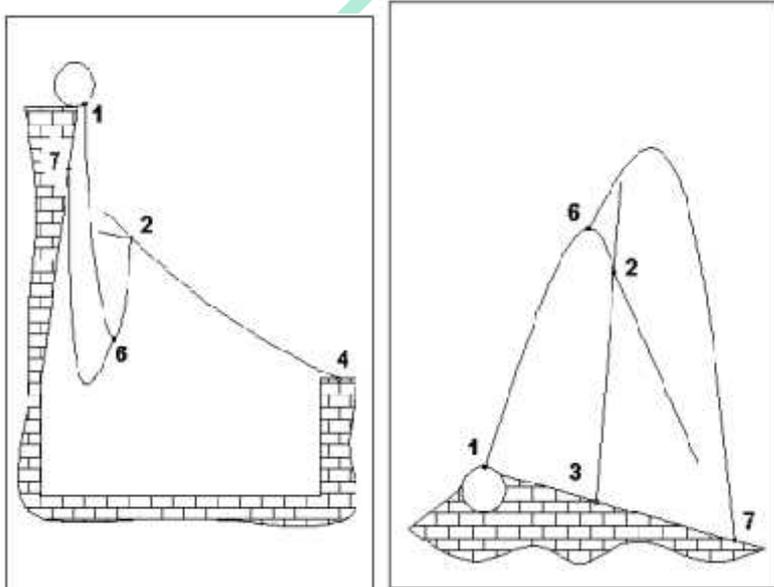
6.2.5. The knots used during work with a rope meet the knotting requirements and rules (Appendix 11).

6.3. Examples of Hitching with the Positions:

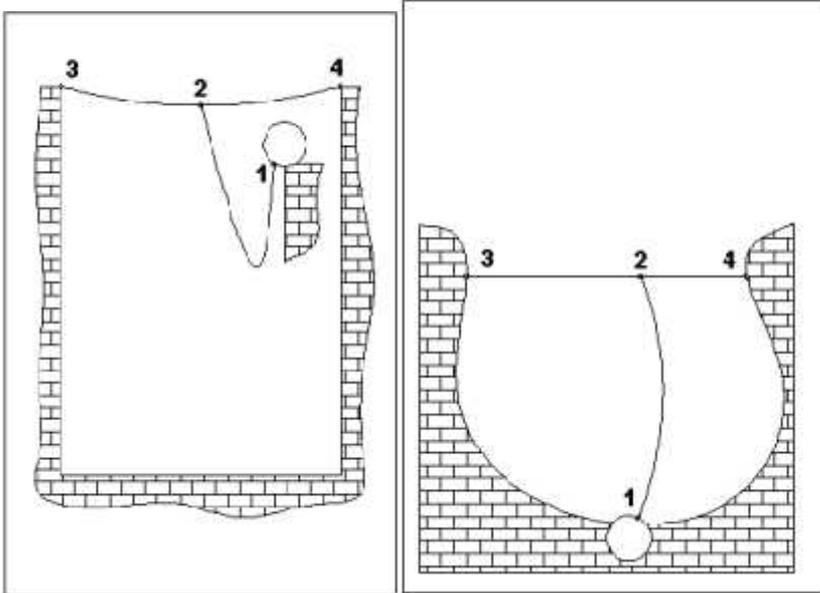
6.3.1. Inclined base (side - view and top view):



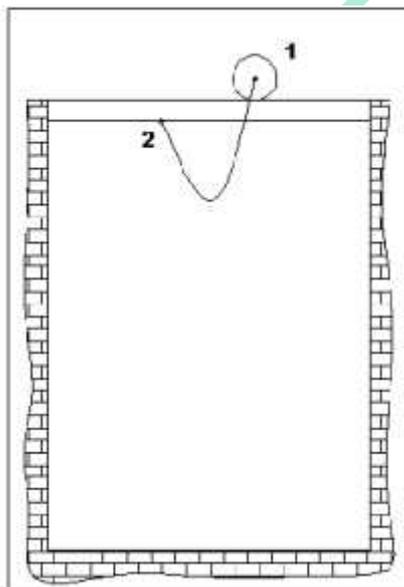
6.3.1.1. Transport leash (the stop and base are not marked)



6.3.2. Horizontal base (side view and top view):



6.3.3. Pendulum:



6.3.4. The name of rope parts of schemes (general for all schemes):

- Between points 1 and 2 - a leash;
- Between points 3 and 4 - a base;
- Between points 2 and 5 - a stop;
- Between points 6 and 7 - a transport leash.

6.3.5. The description of points of attachments (general for all schemes):

1. The leash fastening to the belay system put on a person;
2. The leash fastening to the base (mobile or motionless);
3. A nearest point of attachment of the base;
4. A distant point of attachment of the base;
5. A point of attachment of the stop;
6. A point of attachment of a transport leash to a leash;
7. A point of attachment of a transport leash on a terrain.

6.3.6. Hitching Description:

- 6.3.6.1. The base is fixed between points (pos. 3 and 4) and tensed so that at the moment of maximum loading safe distance from any obstacles located below is provided by the jumper's weight.
- 6.3.6.2. The points (pos. 3 and 4) fix the base ends motionlessly, or pulley is installed in any or both these points. On passing a pulley the base can change a tension direction that gives a chance to increase its general length and accordingly allows to increase energy absorbing features of construction and value of its travel when subjected to loading. The ends passed through pulleys are fixed motionlessly.
- 6.3.6.3. The leash is fastened one end (pos. 1) to the belay system put on a person. Another end (pos. 2) is fastened to the base. The fastening can be realised both by means of a mobile pulley (that gives a chance of hitch travel (pos. 2) along the base and more exact jumper positioning in space at the moment of system loading) and motionless.
- 6.3.6.4. The length of a leash is calculated by distance measurement in vertical direction from a jump point to the nearest obstacle (the rock, the treetops, the water surface, the earth surface, the elements of building structures). Minus difference in vertical direction between points (pos. 2) and jump point. Minus value of travel of a leash attachment point (pos. 2) under system loading. Minus distance from extreme bottom point while braking to the nearest obstacle. Minus reserve for safe landing in case of system part fault.
- 6.3.6.5. The stop is attached one end to a leash (pos. 2), the second – to a motionless point of the terrain (pos. 5). The stop allows to move hitch (pos. 2) along base for more exact jumper positioning in space at the moment of system loading and also carries out auxiliary function after a jump to let the person come down on a firm surface and get free of belay system.
- 6.3.6.6. The variant of fastening of the end of a stop with run out when the necessary run out value is known in advance and is provided by means of the equipment installed in the point of attachment.
- 6.3.6.7. The local restrictor (local thickening of base diameter) can be used in addition to a stop in positioning of a leash point of attachment (pos. 2) which prevents movement of variable point of leash attachment through it (pos. 2).
- 6.3.6.8. The jumper is attached to a leash by means of a belay system, which eliminates any possibility for a person of getting injured during jumping or energy absorbing of jump and descending to the earth.
- 6.3.6.9. In point of attachment of a base (pos. 3 and 4) and a stop (pos.5) installation of devices for rope run out is possible, it allows during a jump to provide motionless attachment of the base and after a jump and energy absorption of falling to extend the base for jumper descend on a firm surface and get free of a belay system.

6.3.6.10. Horizontal Base.

- 6.3.6.10.1. Horizontal base differs from inclined one by absence of a stop (between pos. 2 and 5). Otherwise the design and functional principle are similar.

6.3.6.11. Pendulum.

- 6.3.6.11.1. The simplest scheme. A leash (between pos. 1 and 2) is used only. The point of attachment of a leash (pos. 2) in the course of a jump is motionlessly fixed.

6.3.6.12. The transport leash is used to lift the leash end after a jump to the place of a jump initial position (pos. 1). Its one end is fastened in immediate proximity from a jump place, and another one by means of a sliding element on a leash (between pos. 1 and 2). When a point of attachment of a leash on a jumper (pos. 1) is in the top position, the sliding element of a transport leash is located in the bottom point of the leash overhang (between pos. 1 and 2).

6.3.6.13. The length of a transport leash is calculated so that not to interfere with leash moving (between pos. 1 and 2) during all phases of a jump.

6.3.7. There are the following technical elements except described above:

6.3.7.1. Base point of anchoring.

6.3.7.2. Passing point of anchoring.

6.3.7.3. Deflector.

6.3.7.4. Protector.

6.3.7.5. Knot on a rope.

6.3.7.6. Local restrictor.

6.3.8. The ways of the thick rope fastening to the terrain.

6.3.8.1. The ways of the rope attachment to a natural point support:

- Putting of thick rope around natural point support;
- By means of a local loop.
- By means of the extension made from thick rope.

6.3.8.2. The knots for knotting of thick rope in a local loop are:

- The water figure of eight knot;
- The square knot with overhand knots. Use only in a case of roping a tree trunk closely, not less than three turns of a rope round a trunk (thus the opposite loop (the middle of a local loop) is a cargo loop);
- Grapevine knot;
- Banding (double) bowline.

6.3.8.3. The knots for roping a thick rope to a natural point support:

- Bowline with overhand knot;
- Slip knot with a carabiner to attach to a tree;
- Warp bends;
- Ratline hitch (clove hitch) in case of attachment of the passing point of anchoring to a tree for unload fixed ropes.

6.3.8.4. The knots for fastening of the extension from thick rope:

- double rope;
- Banding (double) bowline.

6.3.8.5. The way of fastening the rope to a man-made point support:

- with use of a connector (a carabiner with lock (locked carabiner, 7mm screwed-closure connector twisted with a wrench). **Thus carabiners must be placed in such a way that a safety catch does not face the terrain.**

6.3.8.6. When using the connector for rope fastening to a man-made point support, use lugs and connectors made from identical materials to increase the lifetime of the product.

6.3.8.7. The base point of anchoring

- 6.3.8.8. **The base point of anchoring** is a place and a way of rope fastening to the terrain by means of point supports, which under dynamic loading provide reliability and integrity of a rope site.
- 6.3.8.9. **The point support** includes rope fastening to the terrain. It can be artificial (various designs man-made point support) and natural (blocks, trees etc.).
- 6.3.8.10. The principles of creation of a man-made point support.
- 6.3.8.10.1. When creating the man-made support it is obligatory to involve:
- minimum 2 man-made point supports;
 - one man-made point support and natural point support;
 - natural point support if it satisfies to following conditions:
 - ✓ Obviously big sizes;
 - ✓ Steady position;
 - ✓ Integrity. It is defined by hammering. Natural point support is considered integral if fluctuations from hammer are not transferred through it.
- 6.3.8.11. The ways of creation of a man-made point support by using natural point support :
- Thick rope is fixed to a natural support, then it is duplicated by attaching a local loop to the same or additional support (loading is applied to a local loop).
 - Thick rope is fixed to a natural support by means of a local loop, and then it is duplicated by attaching the second local loop to the same or additional support.
- 6.3.8.12. Point supports are connected so that in case of destruction of one of them the other works, and the dynamic impact arisen after destruction of the first, is reduced to a minimum.
- 6.3.8.13. A recommended angle between two man-made point supports with top in the basic knot is not more than 90 degrees. When exceeding the angle of 120 degrees use additional man-made point support, which duplicates an upper man-made point support.
- 6.3.8.14. The recommended distance between man-made point supports is not less than 20cm.
- 6.3.8.15. The force application to the knot, leading to its deformation, is not allowed.
- 6.3.8.16. When attaching the base point of anchoring use following connectors: carabiners with locks, screwed-closure connectors.
- 6.3.8.17. Connection of Point Supports**
- 6.3.8.17.1. **Duplication** is the basic loading coming on one point support, the second point support is not loaded. Thus on destructing the loaded point support the second point support is put into action at once, not allowing the possibility of free falling of a person.
- 6.3.8.17.2. **Interconnection.** Loading is distributed between two point supports. For interconnection the V-shaped extension from thick rope is used.
- 6.3.8.17.3. The basic attachment points of rope are:
- The beginning and the end of the base rope hitch;
 - The beginning of the lock rope;
 - Passing points of fastening of the base and lock rope;
 - Extreme points of a fixed rope;
 - Places in which in case of destruction of the passing point of anchoring, thick rope can be damaged and the person can bump on the terrain;

- Places in which the probability of passing point of anchoring destruction is great (poor-quality breed, poor attachment of a man-made point support).
- 6.3.8.17.4. Knots for interconnection (V-shaped fastenings):
- Ears knot on the basis of figure eight knot;
 - Double bowline with overhand knot.
- 6.3.8.17.5. Knots for duplication;
- Figure eight knot,
 - An Austrian (butterfly) knot,
 - Ratline hitch (clove hitch), with reference to passing points of anchoring,
 - Becket bend (double looped) for non-carabiner hitch;
 - All knots applied in interconnection (see «Knots for interconnection»).
- 6.3.8.17.6. The passing point of anchoring is used during the works on a fixed rope attachment;
- 6.3.8.17.7. **The passing point of anchoring** is the point following after a base point of anchoring on purpose to:
- Avoid the rope friction on the terrain, water and rockfall;
 - Divide a vertical site of fixed ropes into shorter sites to facilitate moving on this site.
- 6.3.8.17.8. When working on the passing point of anchoring attachment the following is used:
- One man-made point support;
 - Natural point supports.
- 6.3.8.17.9. The connection of a rope with a passing point of anchoring:
- Refer to para. «The Ways of Rope Fastening to Man-Made Point Support»;
 - Fastening to man-made point support by means of a local loop.
- 6.3.8.17.10. When connecting the rope to a man-made point support by a carabiner use the following knots:
- Figure eight knot;
 - The Austrian (butterfly) knot.
- 6.3.8.17.11. When working on the passing point of anchoring attachment, the standard value of the slack rope is defined by algorithm registered for the «Stop» descender of the Petzl company or its analogues.
- 6.3.8.18. Deflector
- 6.3.8.18.1. **Deflector** is a hitch element, which changes a rope direction. It includes a man-made point support, a natural point support, a connector (screwed closure connector, a carabiner with lock, knot), an extending element (thick rope, tested sling) and the second connector (a locked carabiner).
- 6.3.8.18.2. The fastening of an extending element to the terrain is carried out:
- See ways of rope fastening to a man-made point support and a natural point support;
- 6.3.8.18.3. The deflector is fastened to a thick rope by clasping a thick rope into a pulley with a locked carabiner. The deflector carabiner is rigidly fastened to an extending element to prevent its rotation in knot of an extending element.
- 6.3.8.19. Protector
- 6.3.8.19.1. The protector fastening in a place of rope contact with the terrain:

- A protector is fastened to a terrain (a man-made point support, a natural point support) by means of an auxiliary rope.
- A protector is fastened to a thick rope by means of the prussik made from an auxiliary rope.
- A protector is clasped into a carabiner of a base point of anchoring and a passing point of anchoring by means of an auxiliary rope.

6.3.8.20. Knot on a thick rope

- 6.3.8.20.1. A knot provided not on the ends of the hitch rope for jumps is used, if the rope is connected to another one– for increase of thick rope length.
- 6.3.8.20.2. A knot for thick rope interconnection is the water figure eight knot.
- 6.3.8.20.3. A knot should be knotted and used so that the applied force does not deform a knot.

6.3.8.21. Local Restrictor:

- It is knotted on a base rope for movement restriction of a connecting strap in a direction opposite to its moving during energy absorption of a jump;
- A rope of 5...6 mm in diameter is used;
- It must not change geometry or damage the rope;
- It must not be displaced lengthways of the thick rope during operation;
- It must not interfere with pulleys of a connecting strap movement during the moment of a leash loading;
- A knot for the local restrictor is the Prussik knot.

6.4. Thick Rope Hitching

6.5. **A thick rope** is a part of hitch, intended for absorption of falling person energy and restriction of a fall depth to safe value and tensed with the effort exceeding effort of hands of one person.

- 6.5.1. The base consists of two parallel thick ropes, tensed by means of technical means. The base ropes are located at a distance not interfering with free motion of pulleys of a connecting strap at all jump phases.
- 6.5.2. A base is tensed with a pulley-system.
- 6.5.3. A base tension force provides non traumatic and a comfortable stop of falling of a jumping person.
- 6.5.4. Each thick rope is fixed to the terrain to base point of anchoring from two sides.
- 6.5.5. In base point of anchoring for thick rope a man-made point support (a natural point support) are equally loaded.
- 6.5.6. Use deflector to change a direction of a line of a base rope tension.
- 6.5.7. Do not leave the tensed base on a cam type clamps. Use belay devices of the Gri-Gri type of the Petzl company, locked carabiners or their combinations with obligatory fixing in base point of anchoring.
- 6.5.8. Conditions of a base tension with pulley system application
 - 6.5.8.1. Base is tensed by 1 person.
 - Use not more than five pulley systems.
 - Pulley system is tensed by hand and own weight of a person, at estimated weight of the person equal to 80 kg.
 - Use pulleys with anti-friction bearings (ball bearings).

6.5.8.2. Base is tensioned by 2 persons.

- Use not more than three pulley systems.
- Pulley system is tensed by hand. Tension by own weight of two persons is forbidden.
- Use pulleys with anti-friction bearings (ball bearings).

6.5.8.3. Base is tensioned by 3 persons.

- Use not more than three pulley systems
- Pulley system is tensed by hand. Tension by own weight of three persons is forbidden.
- It is allowed to use pulleys only with friction bearings (on bushings).

6.6. Stop base Hitching

6.6.1. **Stop base** is a part of hitch, thick rope, limiting position of the leash on the base.

6.6.2. For stop base use both dynamic rope and static rope.

6.6.3. The stop base consists of two parallel thick ropes, one end is fixed to terrain and another end – to a leash.

6.6.4. Do not pull a stop base by means of pulley system. Tense only by hand.

6.6.5. Each lock rope is fixed by one end to a connecting strip and by another – to terrain to base point of anchoring. When fastening two lock ropes one of man-made (natural) point supports used for base point of anchoring creation can be common.

6.6.6. In base point of anchoring both lock ropes are equally loaded.

6.7. Leash Hitching

6.7.1. Use only a dynamic rope.

6.7.2. First 2 m of the leash from the jumper side are placed in a protector to avoid getting of limbs between two ropes or getting tangled.

6.7.3. Over total length of a leash the ropes are interconnected with adhesive tape. Distance between anchoring points is 1 ... 1.5 m.

6.8. Connecting Strap Hitching

6.8.1. Connecting strap is used to connect leash and a lock rope to base.

6.8.2. It is made of a thick rope. It is protected by a protector from possible friction of knot projecting parts against connecting carabiners and the pulleys, and also against base ropes.

6.8.3. Place at least two carabiners with locks in each point of anchoring. It is allowed to use only one carabiner with automatic lock for each belay contour.

6.8.4. In addition carabiner locks are fixed from opening with adhesive tape.

6.9. Auxiliary and Transport Rope Hitching

6.9.1. Diameter of auxiliary and transport ropes used is at least 6 mm.

6.9.2. During descending and belaying of cargoes use gloves or mittens for protection of hands skin against burns.

6.9.3. Descend cargo having weight of more than 8 kg using a descender. Use carabiner to create an additional friction.

6.9.4. Auxiliary hitch does not prevent work of the basic rope hitch and jumps.

6.10. Fixed Ropes Hitching

6.10.1. Except friction against terrain, avoid water and sites of stones fall by a competent combination of hitch technical elements and also accurate movement of a person on the hitch.

6.10.2. Avoid sites where stones fall. Mount the hitch to reduce the probability of stone fall on people and equipment to a minimum. Clear preliminarily a movement route and set apart adjacent vertical portions of the hitch.

6.10.3. Fixed rope hitch purpose is to optimize motion of people:

- Use static thick rope. The diameter of thick rope is from 10 mm.
- Reduce the vertical portion of the fixed rope to optimum length from 7 to 12 m.
- The fixed rope work is organized so that people are not situated one under another.
- The transition process from a vertical portion of a fixed rope to a horizontal one should not be excessively labor-consuming for a person.
- The fixed rope allows working of 2 persons simultaneously on one element of horizontal hitch.

7. BASIC RULES OF MOVEMENT ON FIXED ROPE¹

7.1. Equip a person in proper way to move on a fixed rope in compliance with para. "Equipment for Moving on Fixed Rope".

7.2. A person should keep 2 lines attaching to the fixed rope.

7.2.1. The exception to the rule are areas where one line is enough to attach to the fixed rope:

- Rope descent on descender;
- The process of moving on the fixed rope, that points the direction of travel, delivers to a dangerous area, but is not within its area;
- Movement on the terrain using a fixed rope, or vertical portion of fixed rope;
- Serial transfer of line of anchoring through the fixed rope elements when they are fully unloaded and a person is in stable position on a terrain during the whole process of rebelaying.

7.3. Place lines-to-rope anchoring above cargo loops of a harness while moving and hanging up.

7.3.1. Exceptions to this rule are:

- Transition from descent to ascent;
- Overcoming the knot on the rope;
- Lanyard clasped to the slack rope in case when a person is within a zone of the passing point of anchoring.

7.4. A person should not do the following:

- Jerking during movement on the fixed rope;
- Short-term falling on the lines of anchoring fastened to the rope when overcoming any fixed rope element and their combinations.

7.5. The lines of anchoring incorporate:

- Lanyard, fixed in the base (passing) point of anchoring, slack rope, lower part of inclined fixed ropes (near base point of anchoring), horizontal fixed ropes, knot loop on a rope. The lanyard in the base (passing) point of anchoring is fixed to a man-made point support lug, connector of the base (passing) point of anchoring or knot loop of thick rope.
- Leading ascending device and fixing ascending device on vertical and inclined portions of the fixed rope (types of ascending devices are indicated in para.7.8.1);
- Descender for cases described in Section "Basic Rules of Descend";
- Leading ascending device fixed under the knot of base point of anchoring for the case of great slack of fixed ropes (when rope under load is directed perpendicular to the terrain);

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011.

- Use lines of anchoring meeting characteristics of para.5.2.15 (lanyards) and para.5.1.3 (connectors).
- Accessory clamp on a feet is not a line-to-rope anchoring.

7.6. A person should load a descender (men's weight is on the descender) and make sure if he is properly fastened to a thick rope before the last line of static attachment is unfastened. Line of static attachment is a line of anchoring that limits the man's movement on the fixed rope within its own length.

7.7. On overcoming the combinations of technical elements a man-to-hitch lines should be separated (clasped to different hitch elements).

7.8. Basic Rules of Ascending

7.8.1. Carry out ascending on a rope by means of 2 basic ascenders:

- The Ascension ascender of the Petzl company or its analogs (hereinafter referred to as leading ascending device);
- The Croll fixing ascending device of the Petzl company or its analogs (hereinafter referred to as a fixing ascending device).

7.8.2. Use an accessory clamp.

7.8.3. It is forbidden:

- To unlock the clamps' preventers;
- To unfasten leading ascending devices during ascend.

7.8.4. There are the following techniques of ascend on rope depending on the location of loop and usage of accessory clamp:

- A loop is fastened to one leg.
- A loop is fastened to both legs.
- A loop is fastened to one leg, and an accessory clamp – to another one. With that single-step travel is used, one or two legs perform single-step movement.
- A loop is fastened to one leg, and an accessory clamp – to another one. A person uses two-step travel at which two-step motions are performed consequently by using one and then second leg.

7.9. Basic Rules of Descent

7.9.1. Carry out descent on a rope on descenders, not twisting a rope. They are:

- The STOP descenders of the Petzl company or its analogs;
- The GriGri descenders of the Petzl company or its analogs;

7.9.2. A descender is a line of fastening to rope to descend in case when:

- A descender is clasped to a rope to descend and is kept by the man's hand for the rope accommodated in a descender to perform descending.
- A descender is clasped to a thick rope and additionally locked by this very rope (it is locked by the way excluding the arbitrary rope slipping through the descender due to arbitrary unlocking).

7.9.3. A man should adjust the descent speed by using one hand.

7.9.4. The descent speed is adjusted by a man himself. The recommended descend speed is 2 m/s maximum.

7.9.5. To facilitate the descent speed control use a carabiner (hereinafter referred to as service carabiner) additionally. A rope for descending is clasped through it to increase friction.

7.9.6. In case when descend speed can not be controlled by one hand use a service carabiner to increase a rope friction.

- 7.9.7. A service carabiner is clasped to the cargo loop of a harness or to a carabiner attaching the cargo loop of a harness to a descender.
- 7.9.8. Do not use a carabiner attaching the cargo loop of a harness to a descender to increase friction.
- 7.9.9. To perform descent on a descender protect a hand adjusting the descent speed with a glove.
- 7.10. **Basic Rules of Movement on Fixed Rope**
- 7.10.1. When moving on fixed rope fix to it by two lanyards (lines). Exception is movement on a terrain secured by means of fixed ropes.
- 7.10.2. Basic techniques of movement on fixed rope:
- On two lanyards.
 - On two lanyards and a leading ascending device.
 - On a lanyard and a locking carabiner fixed on a central connector.
 - On a lanyard and several carabiners connected in series and fixed on a central connector.
- 7.10.3. Use accessory leading ascending device and fixing ascending device, clamp on feet, pulley. In that case leading ascending device and fixing ascending device are additional lines of anchoring to rope and are not basic lines of anchoring.
- 7.10.4. When using accessory carabiners to fasten to fixed ropes use the carabiners with straight gate only.
- 7.10.5. Attach Lanyard carabiners to double fixed ropes as follows: clasp each carabiner of the lanyard through both ropes. Movement on double fixed rope is similar to movement on single fixed rope.
- 7.11. **Movement on a Terrain with Provision of Belay by Using Fixed Rope, and Vertical Site of Fixed Rope**
- 7.11.1. When moving on a terrain to provide belay of a person fasten him to a fixed rope by means of one line of anchoring. These lines are:
- 7.11.2. for vertical site of fixed rope – leading ascending device with a carabiner clasped through the upper hole in the leading ascending device and a thick rope. The ascender can be loaded partially to keep balance.
- 7.11.3. for horizontal fixed ropes – one lanyard provided with a locking carabiner and a carabiner with straight gate.
- 7.12. **Movement on Inclined Trolley Rope**
- 7.12.1. Move on inclined trolley rope on the thick rope intended for ascending/descending along tensed (trolley) rope. Fasten a person to a trolley rope by means of pulley clasped into a lanyard carabiner. Do not allow fastening to trolley rope with the use of a lanyard carabiner without a pulley.
- 7.12.2. In the process of movement provide individual chest belay for a climber.
- 7.13. **Movement on Horizontal Trolley Rope**
- 7.13.1. When moving on horizontal trolley rope fasten a person to it by two lines.
- 7.13.2. Basic rules of movement on horizontal trolley rope
- On two lanyards.
 - On two lanyards and leading ascending device.
 - On a lanyard and a locking carabiner attached to a central connector.
 - On a lanyard and several carabiners connected in series and fixed on a central connector.
- 7.13.3. Use a pulley to facilitate movement.

- 7.13.4. Use accessory leading ascending device and fixing ascending device, clamp on feet. In that case leading ascending device and fixing ascending device are additional lines of anchoring to rope and are not basic lines of anchoring.
- 7.13.5. When using accessory carabiners to fasten to horizontal trolley rope use the locking carabiners and carabiners with straight gate.
- 7.13.6. In the process of movement provide individual chest belay for a climber.

8. BASIC RULES OF EQUIPMENT CARRYING¹

- 8.1. To carry equipment the caving bags are used.
- 8.2. A caving bag is provided with a carry system to carry it on shoulders and cargo loop to carry suspended.
- 8.3. In the process of a person movement on a fixed rope fasten a caving bag to a central connector of a man by means of a handling cord and a carabiner.
- 8.4. It is allowed to use accessory rope, sling as a handling cord.
- 8.5. Recommended diameter of the handling cord is minimum 6 mm.
- 8.6. A handling cord is clasped to a cargo loop of a caving bag or connected with a cargo loop of a caving bag by means of a locking carabiner.
- 8.7. Do not use carabiners with bayonet lock or without lock.

9. ROPE-JUMPING COORDINATION AND PROVISION

9.1. The following people are assigned to perform coordination of rope-jumping:

- **Leader;**

A leader is assigned from the number of the most experienced certified instructors of the International Federation, having their own experience of coordination of jumps based on the event schedule.

- **Inspector at the Start Check Line;**

Inspector at the start check line is assigned from the number of the most experienced certified instructors of the International Federation based on the event schedule. He is subordinated to a leader.

- **Exit Instructor**

Exit instructor is assigned from the number of the experienced certified instructors of the International Federation based on the event schedule. He is subordinated to a leader and inspector at the start check line.

- **Exit Instructor Assistant;**

Exit instructor assistant is assigned from the number of the experienced certified instructors of the International Federation based on the event schedule. He is subordinated to a leader and exit instructor.

- **Instructor Pulling the Slack of Thick Ropes or a Stop.**

Instructor pulling the slack of thick ropes or a stop is assigned from the number of the most experienced certified instructors of the International Federation based on the event schedule. He is subordinated to a leader and exit instructor.

- **Instructor at the Receiving Area;**

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011.

Instructor at the receiving area is assigned from the number of certified instructors of the International Federation based on the event schedule. He is subordinated to a leader.

9.2. Leader Responsibilities

9.2.1. PRIOR TO PERFORM ROPE-JUMPING A LEADER SHOULD:

- Be medically examined (interval – once a year);
- Study actual weather conditions in the place where rope-jumping event is going to be and forecast for the time of event performing;
- Evaluate the condition of the area receiving a person after a jump;
- Accept reports on readiness of fixed rope, equipment, participants and instructors, communication facilities, life-saving equipment;
- Instruct all event organizers before performing the jumps;
- Check the availability of standby car for probable transportation of an injured man;
- Make it more precise the location and time schedule of the nearest medical establishment be ready to give qualified emergency care;
- Inform the object owner, life-saving service, rescue service about beginning of rope-jumping.

9.2.2. IN THE PROCESS OF ROPE-JUMPING A LEADER SHOULD:

- Coordinate the actions of each instructor and participant of rope-jumping;
- Maintain the established order at the place where the jumps occur;
- Monitor carefully and perform radio communication, require strict compliance by all parties to the rules of radio communication;
- Know constantly the overall situation in the area where rope-jumping occurs according to visual observation and reports of instructors;
- Analyze systematically the meteorological situation in the area where rope-jumping occurs and inform the participants about the changes;
- When facing the critical values of meteorological parameters or limiting distances to dangerous weather, as well as weather conditions that do not meet acceptable, decide to stop jumping;
- Assist participants of rope-jumping when special cases occur;
- Monitor the availability of the next group to perform jumps;
- Monitor compliance with security measures when performing jumps;
- Fill in the "Equipment Inspection Sheet", training log for organizers and participants, make records of all violations and deviations from these rules, as well as deficiencies in provision of jumps.

9.2.3. UPON COMPLETION OF THE JUMPS:

- Report to the dispatcher of the local rescue service about the completion of jumps;
- Prepare for the analysis the data on errors of participants and organizers, shortcomings in ensuring the jumps, violation of rope-jumping rules and preconditions to various incidents.
- Compile and analyze data on execution of jumps;
- Analyze the previous jumps.

9.3. Responsibilities of Exit Instructor

9.3.1. PRIOR TO PERFORM ROPE-JUMPING AN EXIT INSTRUCTOR SHOULD:

- Check availability and serviceability of equipment designed to perform jumps (harnesses, carabiners, helmets, first aid tools, etc.);
- Know the type of a jump of each person and the jump sequence of groups of people;

9.3.2. IN THE PROCESS OF ROPE-JUMPING:

- Fix the leash carabiners to belay system;
- Put on a helmet, check its fixation on the head of a jumper;
- Safely escort a person to the edge of a platform (exit);
- Prevent a jump in the event of fault equipment detection, and other factors that threaten the safety of the jump;
- Monitor the weather condition and in case of its deterioration decide to limit, terminate (fully or partially), or postpone jumping for better weather conditions;
- Stop jumping in compliance with a leader command, or command from instructors at the receiving base or stop base;

9.3.3. On completion of jumps prepare materials for analysis, report to the leader.

9.4. Responsibilities of Exit Instructor Assistant

9.4.1. PRIOR TO PERFORM ROPE-JUMPING AN EXIT INSTRUCTOR ASSISTANT:

- Provide a safe area for assisting, check the fixed ropes for reliability and condition;

9.4.2. IN THE PROCESS OF ROPE-JUMPING:

- Know the type of a jump of each jumper;
- While jumping of a man from exit direct a leash motion according to the type of a jump;
- Prevent a person's jumping in the event of fault equipment detection, and other factors that threaten the safety of the jump;

9.4.3. On completion of jumps prepare materials for analysis, report to the leader.

9.5. Responsibilities of Instructor Pulling-up Bases or Stop

9.5.1. PRIOR TO PERFORM ROPE-JUMPING:

- Give an opinion on the readiness of the receiving (stop) base;
- Report on the readiness to an exit instructor and a leader.

9.5.2. IN THE PROCESS OF ROPE-JUMPING:

- Pull up the stop base according to the weight of a jumper;
- Monitor compliance of the thick ropes tension to a trajectory and depth of jumps during the day and report on this to an exit instructor and a leader.

9.5.3. On completion of rope-jumping: prepare data for analysis and report to the leader.

9.6. Responsibilities of Instructor at the Start Check Line

9.6.1. PRIOR TO PERFORM ROPE-JUMPING:

- Open the start check line, fill in the "Equipment Checklist";
- Together with the exit instructor check the availability and serviceability of equipment designed to perform jumps (harnesses, carabiners, helmets, first aid tools, etc.);

9.6.2. IN THE PROCESS OF ROPE-JUMPING:

- Monitor the state of health of a jumper during the execution of jumps;
- Give an opinion on the readiness of a jumper by personal interview and examination;
- Put on belay systems and check the equipment of a jumper at the start check line;
- Form groups, determine the sequence of jumps;

9.6.3. ON COMPLETION OF ROPE-JUMPING:

- Supervise dismantling of the start check line;
- Prepare the data for analysis and report to the leader.

9.7. Responsibilities of Instructor at the Receiving Area

9.7.1. PRIOR TO PERFORM ROPE-JUMPING:

- Inspect the receiving area for the jumper, remove any foreign objects or obstructions;
- Before jumping over the water check the readiness of the water rescue means;

9.7.2. IN THE PROCESS OF ROPE-JUMPING:

- Observe the jumping people and give commands to adjust the trajectory of jumps, pendulum and depth of jumps;
- Take a person after the jump and help him put off the equipment, specify the safest way to ascend to the place where jumps start, or descend to the nearest road;
- If jumping over the water take a jumper on the shore;
- Keep a record of the quality of jumps and nature of errors of jumpers.

9.7.3. ON COMPLETION OF ROPE-JUMPING:

- Prepare materials for analysis and report the leader;
- Organize the dismantling of the place of jumpers' acceptance.

10. SAFETY REQUIREMENTS BEFORE STARTING TO JUMP

- 10.1. Before starting the event and at the beginning of every day examine a location and put it in order; if it is blocked by the unnecessary subjects disturbing in work, move away all odd things (freely lying stones which can move and fall, branches of trees, equipment out of use, garbage, etc.).
- 10.2. Before starting the event and at the beginning of every day examine equipment, optional accessories, means of communication, means of protection which will be used in work, and make sure in their serviceability.
- 10.3. Before starting the event check and get ready the applied individual equipment and equipment used for a hitch (see Section EQUIPMENT).
- 10.4. The clothes of participants and organizers of event is to be convenient and comfortable, should not limit the movement, not to be too free, not to have the hanging-down ends, laces, straps. All ties, laces should be tied and compactly laid. The footwear has to be rather light, convenient, with a non-slipping sole.
- 10.5. The organizers of event should know the following main general requirements:
 - 10.5.1. Edges of breaks, cracks, etc. of a place of possible people falling should be closed or fenced or specified by warning signs;
 - 10.5.2. Dangerous zones are defined and specified in appropriate way or fenced below a place of jumps;
 - 10.5.3. The worksite has to provide steady situation and freedom of the movement of a person, visual test and safety performance of necessary manipulations. Thus work in the inconvenient position (at considerable flexions, knee-bending, with the extended or highly raised hands, etc.) causing increased fatigue should be excluded (or it is allowed for the short-term period);
 - 10.5.4. The equipment must be reliably attached to avoid its falling from the height.
 - 10.5.5. Before starting make sure in sufficient illumination of a place of the forthcoming event.
- 10.6. Mount the scheme of a hitch on rope-jumping objects precisely according to the approved documentation.
- 10.7. Upon termination of hitch installation, and every day before jumps inspect equipment according to event schedule, i.e. it is performed by assignees in number of not less than 2, including the person responsible for carrying out event (the leader of jumps). Enter the results of survey in "Equipment CheckList" which leader of jumps keeps until the end of event.

- 10.8. Mount the hitch scheme on a new object taking into account the recommendation of para. 6.

11. SAFETY REQUIREMENTS WHEN HOLDING ROPE-JUMPING

- 11.1. All organizers should be in the places determined by event schedule all the time of carrying out jumps.
- 11.2. To check the hitch before the event or in the beginning of the jump-day drop a test load weighing not less than 70 kg.
- 11.3. If the trajectory of load is safe, that is far from any obstacles and the pickup is made at safe distance from the nearest surface (see para. 6.2.2 – providing an altitude margin), the jump is made by the instructor weighing no more than 70 kg, who has to estimate smoothness of pickup and absence of discomfort and pain. The trajectory safety of the instructor movement at all work phases of belay system is estimated by the leader of jumps, the instructor at the receiving area, and the exit instructor.
- 11.4. The distance from a jumper during pickup to a surface of the earth or water is regulated by a tension of bases according to his/her weight. This distance shouldn't be less than 15 m. There is one exception – the surface of the water, which can not be less than 5 m in depth. In that case the distance should be not less than 3 m.
- 11.5. The decision on readiness of all elements of a hitch, all organizers and participants is accepted by the exit instructor after polling all organizers at all technological points (basic and auxiliary).
- 11.6. The instructor at the receiving area after stop of a leash swinging helps a jumper to come down to a receiving platform and remove equipment.
- 11.7. Exit surface should be even, cleaned from foreign objects, preventing to perform unrestrictedly a jump.
- 11.8. All elements of a hitch and belay system of a jumping person should be duplicated.
- 11.9. The approach to the exit and a jump are carried out only after the command of the exit instructor.
- 11.10. Before the approach to the exit for making jump a person should execute warm-up exercises for knees, shoulder and elbow joints, waists, backs and necks.
- 11.11. Until a moment of jumping at the exit a jumper should be fastened to fixed ropes which exclude his casual falling. The length of a belay should exclude falling with a fall factor more than 0.5. The exit instructor releases jumper from the belay after full readiness of all elements of the rope scheme, when a leash is attached to the person and each involved is reported on a handheld transceiver that the jump is carried out.
- 11.12. Order of Jump Performance:
- Come as close to the edge of an exit as you can, for a platform it is necessary that toes of a jumper are extended on 2-3 cm from edge of a platform;
 - Jump out forward and up at an angle about 45 °. Keep body bent in a waist, slightly move apart feet, pull toes down, and slightly bend knees. Extend straight arms forward. After separation it is necessary to keep a deflection and to watch above horizon level;



- After starting to move the head down, take out hands forward and bend elbow joints so that the hand from a shoulder to an elbow makes an angle about 90° relative to body, and from elbow to a hand is parallel to body. Bend feet in knees so that between part of a foot from a hip to a knee and part from a knee to a foot an angle about 90° is made, and move feet apart as much as possible. In such position fall until you are picked up by a rope. It is necessary to hold such opened body position in flight, and not to flap hands and feet, not to take a rope and elements of belay system.



- 11.13. Considering that falling from the height can become an accident cause, the person needs to be especially attentive and careful during event.
- 11.14. During event observe that the elements of belay system aren't damaged by an object from which person jumps, or other external objects, and also by other elements of the rope system. To prevent similar damages use protectors.
- 11.15. Before each jump carry out double check (check by the exit instructor and instructor at the start check line) of knot points of rope system (points which are in work), and the jumper connectors to a leash. Pay special attention to compliance of tension of thick ropes to the weight of a person.
- 11.16. Use means of individual protection of a jumper - a helmet, gloves, a protector on a rope (near a jumper) - to prevent possible getting of limbs between ropes.
- 11.17. Use the equipment, which exclude possibility of receiving a spine injury due to harsh load of a back (extension). This equipment includes the leg loops plus a chest harness interconnected between themselves by an independent piece of a rope (the state when one is slightly bent forward), an integral harness.
- 11.18. The place for a jump should be chosen so that when falling from edge in any position and without pushing even casual falling does not lead to collision with object. Otherwise, equip a portable platform, use an additional belay until leaving a dangerous zone, or refuse from jumps in that place.
- 11.19. Organize safe stay of people on an object (including, but not limiting by anchoring, fencing of dangerous zones, ascending with a belay, etc.), and do not let people go to potentially dangerous places (in case of necessity of overcoming a dangerous area organize a belay).
- 11.20. Organize and control the safety of the people who are below in the course of jumps– in order to avoid traumatizing by the falling subjects. Avoid jumps over the people who are under a jump trajectory, use a protective tape for potentially dangerous places, and if necessary - provide location of the person ensuring constant visual control of such places.
- 11.21. Inform all participants about potential possible dangers during event, and about rules of behavior in the territory of event. It is necessary to have the relevant briefing log.
- 11.22. All organizers of event should have self-respect, a tidy look, clean and convenient clothes. The clothes shouldn't bear any other information than a trademark of clothes or information about activity of organizers of event, or about sponsors of event.
- 11.23. When carrying out an event, the use of an offensive language by all participants of event, and the use of statements and expressions, that can cause moral damage on the national, religious and social ground to participants of event and strangers, is strictly forbidden.
- 11.24. It is strictly forbidden to create conflict situations, and intake alcohol, narcotic or toxic substances and other strong preparations at the territory of event.
- 11.25. From the side of the organizers any pressure upon participants of event and perforce coercion to jump is forbidden.
- 11.26. During event it is not allowed to stay under exit, and in a zone of possible stones or other subjects falling.
- 11.27. During stay on the high-located surfaces with a slope more than 20° or at a distance less than 2 m from an edge of steep the participants and organizers should be fastened.
- 11.28. The constantly fixed ropes should be provided for fastening the belay systems. Fixed ropes should allow to move easily in a working zone and provide access to all points of the hitch applied in work without loss of belay.

- 11.29. The places of the fixed rope installation are specified to responsible persons by organizers of event.
- 11.30. Rise and lowering of loads weighing more than 20 kg should be made by lifting devices.
- 11.31. During the work at some height the equipment and tools should be reliably fixed on belay system or laid in a caving bag.
- 11.32. During the breaks the equipment, materials, the tools and other small subjects, which are on the high-located place, should be fixed or taken away in order to avoid their possible falling.
- 11.33. The jumps should be stopped if the following occurs: increase of the wind speed to 8m/s, deterioration of the visibility because of darkness or fog, coming of a storm or appearing of ice-slick.

12. SAFETY REQUIREMENTS IN EMERGENCIES

- 12.1. In the event of emergencies and accidents:
 - Stop event immediately and inform the leader of jumps;
 - Take measures quickly under the leadership of the leader of jumps to eliminate the reasons of accidents or situations, which can lead to emergencies or accidents.
- 12.2. During accident:
 - Organize immediately first aid to the victim and if necessary transport him to medical establishment.
 - Take urgent measures for prevention the development of emergency or other extraordinary situation and impact of injuring factors on other persons.
 - Keep everything in its place prior to accident investigation if it doesn't threaten life and health of other persons and doesn't conduct to accident, emergence or emergence circumstances of other force majeure, and in case of impossibility of its preservation record the developed situation (make schemes, hold other events).
- 12.3. In the event of fire immediately call fire brigade; take away people to a safe place and start fire elimination by fire extinguishing facilities, inform the leader.

13. SAFETY REQUIREMENTS ON TERMINATION OF JUMPS

- 13.1. Specify the quantity of jumps per day and possible remarks concerning the used equipment in the "Equipment Checklist".
- 13.2. Report to the leader of jumps about all shortcomings noticed in operation time and measures taken for their elimination.
- 13.3. Weaken tension of ropes by the maximum possible value, fix reliably all elements of a hitch to keep them safe till next jump-day;
- 13.4. Take away unnecessary equipment and the service equipment from a place of jumps;
- 13.5. Cover surely the taken away equipment to prevent its failure and loss of performance data;
- 13.6. If it is the last day of event, dismantle all elements of a hitch, equipment and pack them for the subsequent transportation to a storage place;
- 13.7. Report the leader of jumps about all noticed malfunctions;

Appendix 1. Operation of Rope ¹

Maximum breaking load for a rope without knots and the recommended loads in process of its operation

Rope diameter, mm	Recommended workload, kN, maximum	Maximum breaking load, kgf
8	3	from 1800
9	3	from 1800
10	4	from 2400
11	5	from 3000

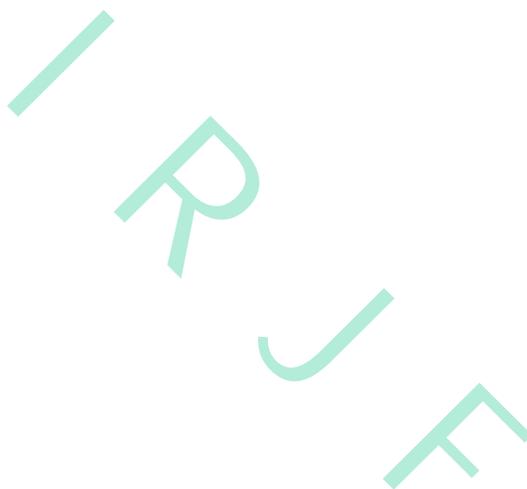
Requirements to Rope Storage and Maintenance

1. The rope shouldn't be contaminated by the time of the beginning of jumps.
2. The lifecycle of a rope shouldn't exceed specified term given in the certificate of a rope. At active operation it shouldn't exceed 2 years, at one-time operation and correct storage – no more than 5 years from the moment of rope production.
3. The rope should be operated at air temperatures from -40 to +60 °C.
4. The rope should be stored in a dark, dry place and far from sources of heat, fuels and lubricants and chemicals.
5. It is forbidden to store a knotted rope.
6. The rope should be immediately replaced:
 - If production defects in appearance (the sticking-out threads, ruptures of locks, tying up of core of a rope inside braid, change of diameter, etc.) are detected;
 - After strong temperature influence and friction, an external sign is a melting of braid;
 - After strong axial and radial deformations (availability of curing, knots, friability);
 - After contact with chemical active agents (alkali and acids);
 - After strong braid shift;
 - After strong mechanical tension (greater than specified in the column "Recommended Operational Load");
 - If one contour of the hitch was in operation, and the second was damaged or broken;
 - At strong wear and a rupture of braid (rubbed surfaces);
 - After pollution by bitumen, sand, clay, oils, paint.
7. Meeting of the requirements stated above should be reflected in the individual certificate for each rope.
8. The actual loads on key sites of a hitch should be confirmed by test reports.

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011

Rules of Rope Input in Operation and its Operation

1. External inspection on detection of production defects.
2. Removal of production defects.
3. Soaking and drying (rope shrinkage to 12-15 %).
4. The measurement of a rope length.
5. The marking of a rope length.
6. Regular inspection, after use.
7. Washing from contamination.
8. Drying.
9. Repeated measurement of a rope length and remarking.



Appendix 2. Troubleshooting of Ropes¹

No.	Fault	Cause	Correction	Serviceability
1	Yarn disintegration (separate loops of yarns coming out from braid)	Reject in the process of manufacturing	Carefully put it back inside the braid	Operation is authorized
2	Place of yarn twisting (local thickening)	Reject in the process of manufacturing	Cut out during the first check	Use the residual rope
3	Melting of ropes (sticking of two ropes at the ends by melting the fibers)	Reject in the process of manufacturing	Cut out during the first check	Use the residual rope
4	Chafe of braid (chafe marks)	Incorrect procedure of hitch attachment, transportation, natural wear	Eliminate actual factor: move the hitch to correct place, pack again	Operation is authorized
5	Chafe of braid (intense chafe marks)	Incorrect procedure of hitch attachment, transportation, natural wear	Eliminate actual factor: cut out this piece of damaged rope	Use the residual rope
6	Partial break of braid	Incorrect procedure of hitch attachment, transportation, dynamic load, multiple pressing of rope by a clamp under the knot, shot with a stone	Unload, move the hitch to correct place, mark the damaged portion when getting out; cut out the damaged portion	Use the residual rope
7	Break of braid and partial break of core	Incorrect procedure of hitch attachment, transportation, dynamic load, multiple pressing of rope by a clamp under the knot, shot with a stone	Unload, move the hitch to correct place, mark the damaged portion when getting out; cut out the damaged portion	Use the residual rope

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011

8	High dynamic pressure	Incorrect procedure of hitch attachment , high dynamic impact (greater than in "Recommended Operational Load" or actuation of only one contour of hitch	-	Reject the portion of rope subjected to loading
9	Partial melting (minor, significant)	Quicklink descent	Eliminate actual factor, cut out the piece of damaged rope	To be rejected
10	Old rope	Continuous operation	-	To be rejected, for use in housekeeping only

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Appendix 3. Troubleshooting of Connectors¹

Carabiners

No.	Fault	Cause	Correction	Serviceability
1	Lock jamming (can not be opened)	A carabiner is twisted under load, contamination	Load; untwist. Clean and grease.	Operation is authorized
2	Gate jamming	Wear out due to continuous operation, unavailable maintenance, contamination.	Clean and grease.	1) If jamming is eliminated, operation is authorized. 2) If no, to be rejected
3	Failure to the gate retracting mechanism	Wear out due to continuous operation, defective mechanism.	-	To be rejected
4	Partial or full falling out of the gate rivets	Reject in the process of manufacturing, continuous operation, unavailable maintenance.	-	To be rejected
5	Chafing of a carabiner by a rope (wire rope), determined visually (working-out of over 0.1 dia. of a carabiner)	Usage of a descender having attachment of rope passing through a carabiner (without protection), belay passing through a carabiner, descent using a carabiner, motion on trolley.	-	To be rejected
6	Deformation of contour	Overload, falling from the height of more than 10 m	-	To be rejected

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011

Screwed-closure connectors (Quicklink; type Q)

No.	Fault	Cause	Correction	Serviceability
1	Lock is twisted difficult	Minor unbending of quicklink, contamination, reject.	Clean, grease.	Operation is authorized
2	Lock jamming	Yarn deformation due to untwisting (twisting) under load	Clean, grease.	Operation is authorized. If yarn deformation is detected (over 2 turns) – to be rejected
6	Deformation of screwed-closure connector	Overload, quicklink in untwisted condition under load, falling from a height of more than 10 m	-	To be rejected

Appendix 4. Troubleshooting of Harnesses¹

No.	Fault	Cause	Correction	Serviceability
1	Clay contaminated	Absence of equipment service	Clean, wash	Operation is authorized
2	Wiped out seams	Continuous operation	-	To be rejected
3	Tear of load-bearing seams	Continuous operation	-	To be rejected
4	Tear of load-bearing belts	Continuous operation	-	To be rejected
5	Notch of load-bearing belts by buckles	Continuous operation , absence of equipment adjustment	-	To be rejected
6	Break of accessory loops	Application of force greater than recommended	Sew an accessory loop or remove it	Operation is authorized
7	Contamination caused by chemical substances (oils, paint etc.)	Operation in industry	-	To be rejected

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011

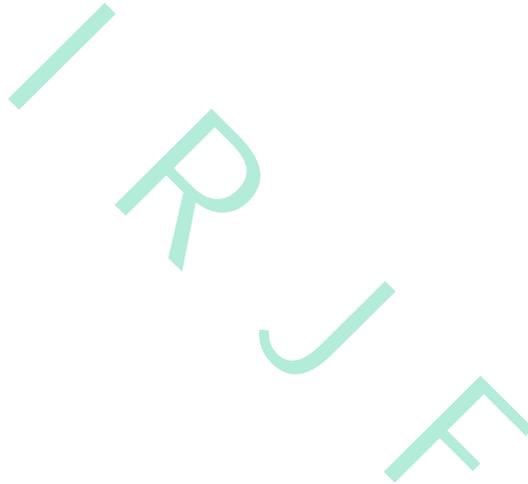
Appendix 5. Test parameters according to EN 1891¹

Test Parameters according to EN 1891	Limit for type A	Limit for type B
Impact load, F Peak load, transmitted to point support with fall factor 0.3 of load having a mass of M kg, should not exceed 6kN	M=100 kg	M=80 kg
Quantity of falls, N A rope of 2 m length with figure of eight knot (loop) is used; fall factor is 1.0. A rope should carry five or more jerks of such a kind with time interval 3 min, load of M kg.	M=100 kg	M=80 kg
Elongation, E Percentage of rope length without knots variation under loads within 50 to 150 kg.	E ≤ 5%	
Knotting factor, K Single knot (overhand knot) is tied on a rope with a force of 10 kg during one minute. Tension decreases to 1 kg and knot inner diameter is measured. K is a knot inner diameter divided by the used rope diameter.	K < 1.2	
Shift of braid relative to core, S A rope of 2 m length is pulled through the pulling mechanism (structure specified in document EN) for 5 times. Shift of braid is measured in mm.	S ≤ (180-10D), where D – rope diameter	S ≤ 15
Braid percentage, M Braid mass is divided by total mass of the rope	30% < M < 50%	
Static strength (without knots), T Load, under which a rope without knots, pressed between clamps, is broken.	T > 22kN	T > 18kN

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011

Static strength (with knots), T_k Force, above which a rope with two figure of eight knots being loaded during 3 min, is broken.	T _k >15kN	T _k >12kN
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The Standard also requires for the rope to contain inner color marks (fibers) indicating the year of manufacturing. Each end of a new rope should be provided with a manufacturer's name, type of rope (A or B), diameter, CE mark and number of the EN standard, and number of Certification center approved the rope.



Appendix 6. Test parameters according to EN 892¹

Test Parameters according to EN 892	Limit for type A	Limit for type Б
<p>Impact load, F</p> <p>Peak load, transmitted to point support with fall factor 1,77 f load having a mass of M kg, should not exceed FkN. The test is conducted using the UIAA equipment for dynamic loads.</p>	<p>M= 80 kg</p> <p>F < 12kN</p>	<p>M= 55 kg</p> <p>F < 8kN</p>
<p>Dynamic elongation, D</p> <p>In the above described test with impact load maximum tension of rope is recorded.</p>	<p>D<= 40%</p>	
<p>Quantity of falls, N</p> <p>A rope should carry five or more falls with time interval 3 min, load of M kg. The test is conducted using the UIAA equipment for dynamic loads.</p>	<p>M= 80 kg</p>	<p>M= 55 kg</p>
<p>Elongation, E</p> <p>Percentage of rope length without knots variation under load of 80 kg.</p>	<p>E <= 8%</p>	<p>E <= 10%</p>
<p>Knotting factor, K</p> <p>Single knot (overhand knot) is tied on a rope with a force of 10 kg during one minute. Tension decreases to 1 kg and knot inner diameter is measured. K is a knot inner diameter divided by the used rope diameter.</p>	<p>K < 1.1</p>	
<p>Shift of braid relative to core, S</p> <p>A rope of 2 m length is pulled through the pulling mechanism (structure specified in document EN) for 5 times. Shift of braid is measured in mm.</p>	<p>S<= 40 mm (or 2%)</p>	

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011

Appendix 7. Troubleshooting of Clamps¹

No.	Fault	Cause	Correction	Serviceability
1	Wear of housing	Wear due to continuous operation, incorrect motion of a clamp along a rope, dirty rope	----	To be rejected
2	Wear of a cam	Rejection, incorrect motion of a clamp along a rope, dirty rope	----	To be rejected
3	Failure to a pressure spring of a cam	Rejection, absence of maintenance, contamination.	----	To be rejected
4	Failure to a cam catch	Rejection, catch under load.	----	To be rejected
5	Failure to a catch spring of a cam	Rejection, absence of maintenance, contamination.	Replace spring	Operation is authorized
6	Deformation of a clamp	Incorrect load, great dynamic load, falling from a height of more than 10 m	----	To be rejected
7	Seizure in opening the clamp, jamming	Rejection, absence of maintenance, contamination.	Perform maintenance	Operation is authorized
8	Slot between housing and cam shifted to the extreme position (catch is not shifted)	Rejection.	----	To be rejected

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011

Appendix 8. Troubleshooting of Pulleys¹

No.	Fault	Cause	Correction	Serviceability
1	Scrape in rotating pulley	Dirt in a pulley, absence of maintenance	Perform maintenance	Operation is authorized
2	Deformation of pulley housing	Great load, great dynamic load, incorrect operation, falling from a height of more than 10 m	-	To be rejected
3	Sharp edges of pulley	Contaminated rope, continuous operation.	Round the edges of pulley using the needle file	Operation is authorized
4	Wear of a pulley due to contact with rope (cable), determined visually (workout of a pulley up to bushing)	Usage of cable duralumin pulley, continuous operation.	-	To be rejected

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011

Appendix 9. Troubleshooting of Lugs¹

No.	Fault	Cause	Correction	Serviceability
1	A lug is corroded (rust)	Usage of corrosion non-resistant alloy	-	To be rejected
2	Workout of metal by more than 1\10	Continuous operation, usage of duralumin and steel alloys combination	-	To be rejected
3	Overtuned thread of a bolt, overturned slot of a bolt	Improper operation, excess force in screwing, bolt's alloy does not meet recommendations	-	To be rejected
4	Dirty thread of a bolt	Clay contamination, carrying without a cover	Clean, grease	Operation is authorized

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011

Appendix 10. Troubleshooting of Slings¹

No.	Fault	Cause	Correction	Serviceability
1	Partial tear of sling	Continuous, incorrect operation, technical contamination	-	To be rejected
2	Discontinuity of sling seams	Continuous, incorrect operation, technical contamination	-	To be rejected
3	Chafe of sling (intense chafe marks)	Continuous, incorrect operation, technical contamination	-	To be rejected

¹Чердниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011

Appendix 11. Requirements and Rules to Knotting¹

Requirements to Knots:

- 1) Reliability – stable under load (do not shifted, untied), great breaking strength;
- 2) Complied maximum with goals of usage;
- 3) Untied easily and quickly independently of diameter and condition of a rope – whether it is firm, soft, dirty, wet or so;
- 4) Easily identified (typical knots), simply knotted.

Rules of Knotting

1. A knot should be smoothed down.
2. A knot should be tightened (absence of clearances in the knot core). When applying the force of hands maximum 3 Ø of rope is pulled out from the tightened knot
3. Base knot is knotted together with overhand knot. Exception: figure-8 loops, butterfly knot, grapevine.
4. Overhand knot is knotted at a distance not farther than 5 cm from the base knot.

Residual rope (extending from a knot) should not be less than 10 Ø of a rope. For lock knots at the ends of a rope – minimum 20 Ø of a rope.

¹Чередниченко Ф.Л., Чанышева А.Ф., Ваш. Э. Техника SRT Правила. Москва, 2011

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