Basic Intervention Techniques

General:

It is difficult to standardise or predefine operational procedures. But a starting point is necessary to provide a base for the development of special rescue groups within Europe and to give guidance on best practice for basic rescue operations .
Typical incidents for special rescue groups are:

- Descending into depth and the rescue of casualties from depth
- Rescue of casualties from heights or from a rope
- Lead climbing
- Cable ways

The aim of these intervention techniques is to ensure safe working for fire fighters / special rescuers while rescuing casualties, animals, goods from the endangered area of "height and depth" and to improve the service at fires and technical rescue from height and depth.

Index:

(*) these intervention techniques are not performed by special rescue groups in the Unite Kingdom

Basic Intervention Technique 1:

Passive descending on a single rope and a safety rope

Task:
Safe descending of one or more people. The rescuer is lowered via an anchored descending device by 2 people. It is possible to lower untrained people (emergency doctor, emergency technician, police etc....)

Equipment:
Personal protective equipment including accessories, 1 safety rope, 1 low stretch work rope, slings, carabiners with safety lock, accessory cord (for block knots), edge protection (e.g. Rollmodule), 1 descender for a single rope, 1 rescue strop

Personnel:
3 rescuer, 1 rescuer at the safety rope, 1 rescuer at the work rope, 1 rescuer for the descend

Anchorage:
1 anchor for the work rope , 1 anchor for the safety rope. If necessary choose additional anchor points!

Note:
The descending system is set up so that if an uncontrolled acceleration the descending procedure will be blocked. In any event this system requires close attention during the descent.

Attention:
Ensure correct placement of the rope into the descending device. Look at the description or the picture on the device. Learn the advantages and disadvantages of the descending device. Use only approved equipment.
Before lowering a person, a pulley system (see Basic Intervention Technique 3 – pulley system) for hauling should be prepared.

Procedure:

Safety rope with HMS- and block knot (Machard or Prussik) or propriety back up devices

Anchor safety system with round slings (edge protection)
Ensure that the anchor of the work rope and the safety rope are separate
Ensure that the anchor is sufficient, if not choose additional anchors

Figure of eight knot e.g. With double loops at the end of the safety rope

Before tightening adjust the length of the loops (1 short,1 long)

Attach the long loop on the upper part of the belt of the rescuer, rescue strop to the short loop
Is the figure of eight knot made correctly and are all carabiners looked?

HMS at the safety rope
(carabiner needs to be a redundant one)

Block the HMS with a slip knot
Slip close to the HMS
The opposite slip needs to go round both ropes

The HMS must always be blocked with a slip knot if the rescuer is in a fixed position

Position the block knot Machard or prussic at the safety rope on the brake side

At least 3 slips/slings around
Connecting knot of the block knot shall not be positioned on slips or the carabiner
Connect the block knot to the sit harness, so one can get disconnected in case of a possible activation of the safety system.

* in France and UK the safety rope is not secured with a HMS but with a safety device

Work rope (low-stretch) with descending device for single rope

Anchor the safety system with round slings (edge protection)
Ensure that the work rope and the safety rope are separate
Ensure that the anchor is sufficient, if not choose additional anchors

Figure of eight knot e.g. With double loops at the end of the work rope
Before tightening, control the length of the loops (1 short, 1 long)
Attach the long loop on the lower part of the belt of the rescuer, rescue strop to the short loop
Is the figure of eight knot made correctly and are all carabiners closed?

Attaching the rope to the descending device (e.g. Stop, Gri-Gri, I´D, Radeberger Haken, etc.)
Ensure the work rope is correctly attached to the descending device (device note)
Attach the descending device to an anchor

The descending device needs always to be blocked via a slip knot.
A descending device with a auto block is especially good for such an action, because a pulley system can be quickly installed!

Descending

Safety check with oral examination
(carabiner, rope placement, knots, safety system, block knot in position)

If safety check is ok the slip knots of the work and safety rope are opened and the rescuer is slowly descended

Depending on the descending device the use of a divert carabiner might be necessary

Constant and slow lowering of the person
Always work on sight or via radio communication
Caution while lowering 2 persons, control the brake effect of the descending device

Blocking while descending
Blocking the safety rope via a slip knot
Blocking the work rope via a slip knot

Basic Intervention Technique 2:

Active descending on a double or single rope

Task:
Safe and independent descending with the aid of different devices

Equipment:
Personal protective equipment with accessories, 1 dynamic or low stretch rope, round slings, carabiners with safety lock, edge protection, 1 descending device for double or single rope, 1 accessory cord (for block knots) or blocking device (shunt)

Personnel:
1 to 2 rescuer

Anchorage:
Static anchorage at least 2 points

Note:
At descends on a double rope, both ropes need to be attached at 2 different anchors. Below a descending device for double ropes there always needs to be a safety system (block knot or blocking device) in place to block uncontrolled descend by unplanned opening of the brake hand. While using double rope, a safety rope may not be necessary . Descending on a single rope a safety rope need always to be guided by a second rescuer.

Before going over the edge the carabiner and the descending system needs to be checked. Carabiners need to be locked and must not go crosswise under load. Never perform rapid descends, because the descending device will get hot and damage the rope. On longer descents (> 100 m) an adequate descending device should be used or intermediate stops prepared. At the end of the descend, take the descending device immediately out of the rope (danger of burns).

Attention:
The descending device and the safety system need to be attached separately, with the safety device kept as high as possible when putting a load onto the rope, the body weight needs to be brought first onto the descending device.

Note:
In Germany and the UK some organisations descend on a single rope with a safety rope controlled from the top

Procedure:

Setting up of the double rope

2 anchors for the ropes with round slings (edge protection)
Ensure that both anchors are separate
Ensure that the anchors are sufficient, if not choose additional anchors!

Connect 1 work rope from the middle with 2 figure of eight knots or 2 work ropes to 2 anchors
Ensure that both ropes are separately anchored.
Is the figure of eight knot made correctly and are all carabiners looked?

Self securing with a safety rope
If necessary build a safety ring

Lower the rope or take it with you in a rope bag
Don't forget knots at the end of the rope!!!

Attach block knot Machard or prussic or blocking device (shunt) to the double rope
At least 3 slips/slings around connecting knot of the block knot shall not be positioned on the slips or the carabiner

Attachment via carabiner to the sit harness

Attach the descending device for double rope (figure of eight, GiGI-plate, HMS, etc) above the block knot

Check the correct attachment of the double rope to the descending device (device notes)

The descending device is connected via a short lanyard to the belt (about head high)

Descending procedure

Safety check
(carabiner, rope placement, knots, block knot in position)
If safety is in place before the rescuer goes over the edge and the safety lanyard is disconnected
While putting load on to the rope, the body weight needs to be brought first into the descending device and not into the safety system
Caution at the edge, danger of being blocked, edge protection; device must not be loaded over an edge

Taking the blocking system with you
Don't grip the blocking device and block knots, only hold it with fingertips (panic reaction through griping)

Constant and slow descending
Always work on sight or via radio communication

Blocking while descending
Let go the block knot or the blocking device

Descending on a single rope

Systems like Gri-Gri, stop, I´D which have a built in automatic blocking system, always need a separate safety rope.

In the UK the safety rope is frequently controlled by the person descending.

Basic Intervention Technique 3

Rescuing from depth with the aid of a pulley system on a single rope

Task:
The casualty is lifted while being secured via a rope control device.
In this tactical variation the pulling force is reduced by using ascenders and pulleys without reducing safety.

Equipment:
Personal protective equipment with accessories, 1 safety rope (), 1 work rope , round slings, carabiner with safety lock, accessory cord (for block knots), edge protection (e.g. Rollmodule), 1 descending device for single rope, 1 rescue strop, ascender, pulley

Personnel:
3 rescuer, 1 rescuer at the safety rope, 1 rescuer at the work rope, 1rescuer for the hauling

Anchorage:
1 anchor for low stretch rope , 1 anchor for dynamic rope. If necessary choose additional anchor points!

Note:
Install the pulley system directly above the casualty (avoid diagonal pull).if the rope is pulled over an edge use edge protection and edge rollers. Edge rollers reduce the friction to quite an amount.
While working at windows it is of advantage to place the anchor in the floor above, because otherwise while going out or in the pressure towards to the window sill is to great. At an abyss consider the use of a tripod or crane.

Note:
There are different ways of using a pulley system (potential and factor pulley system) where different equipment is being used. Winches or the Greifzug can also be used. The use of back slip stops are essential (e.g. Gri-Gri, I'D).
This Basic Intervention Technique is basically the same as Basic Intervention Technique 1 with an added pulley system. This Basic Intervention Technique allows a quick change from passive descending to hauling. The disadvantage is, that building up the system is not that fast and therefore active descending is in certain situations preferable because of the speed.

Procedure:

Safety rope with HMS- or block knots (Machard or prusik) or proprietary rope control device

Anchor for safety system with round slings, alternative clove hitch (edge protection)
Control if the work rope and the safety rope are separate
Control if the anchor is sufficient, if not choose additional anchors!

Figure of eight knots e.g. With double loops at the end of the rope
Before tighten control the length of the loops (1 short, 1 long)
Attach the long loop to the upper part of the belt of the rescuer, rescue triangle to the short sling
Is the figure of eight knot made correctly and are all carabiners locked?

HMS at the safety rope
(carabiner needs to bee a redundant one)

Block the HMS with a slip knot
Slip close to the HMS
The opposite slip needs to go round both ropes
The HMS knot needs always to be blocked via a slip knot if one leaves the position.

Position the block knot Machard or Prussik at the safety rope on the brake side

At least 3 slips/slings around
Connecting knot of the block knot shall not be positioned on the slips no the carabiner
Attachment is done to the sit harness or the anchor and is guided by the brake hand. It is of advantages to connect the block knot not to the sit harness, so one can get disconnected in case of a possible activation of the safety system.

Work rope (low stretch) with an automatic descending device for single rope

Anchor for safety system with round slings (edge protection)
Control if the work rope and the safety rope are separate. Control if the anchor is sufficient, if not choose additional anchors

Figure of eight knot e.g. With double loops at the end of the work rope
Before tighten control the length of the slings (1 short, 1 long)
Attach the long sling on the lower part of the belt of the rescuer, rescue triangle at the short sling. Is the figure of eight knot made correctly

and are all carabiners closed?

Attaching the work rope to the back slip stop (Gri-Gri, I´D)
Control the attaching of the work rope into the descending device (device note)
Attach the descending device to an anchor
The back slip stop device needs always to be blocked via a slip knot if one leaves the position.

Hauling

Safety check with oral examination
(carabiner, rope placement, knots, safety system, block knot in position)

Apply ascender with pulley between rescuer and back slip stop device at the work rope

Guide exit rope at the back slip device through pulley

Loosen the blockade at the back slip device and haul the slack rope

If necessary divert the pull

Before beginning loosen the safety rope and tighten
Pull ropes of the pulley system must never run upon each other (rope protection via or edge protection)

The safety rescuer guides the safety system tight and observes with attention the hauling!

If necessary apply 2nd ascender with pulley

If necessary let several people haul attention that the load does not exceeds 4 kN (coat damage)

Constant and slow hauling of the people
Always work on sight or via radio communication
Pay attention to the rope running and the edge protection

Blocking while hauling
Blocking the safety rope via a slip knot
Blocking the work rope via a slip knot

Basic Intervention Technique 4

Lead climb

Task:
Lead climb

Equipment:
Personal protective equipment including accessories , 1 dynamic rope, several round slings for intermediate anchors, carabiner with safety lock, safety device (Gri-Gri), edge protection

Personnel:
2 rescuers

Anchorage:
Static anchors and intermediate anchors

Note:
At a possible fall great forces can occur, or the danger of a hitting the structure can be very great. Because of this the safety rescuer needs to work very concentrated (danger of slack in the rope). The anchors need to be corresponding strong (min. 22 kN). The intermediate anchors are supposed to be placed in suitable distances (hitting the ground or structure must be avoided).the intermediate anchors should be positioned if possible in a straight line, because otherwise the friction forces will be to high. Round slings need to be shortened by winding them several times around the anchor and need to be fixed against slipping. Note that the carabiners in case of a fall are not loaded wrong.

Attention:
Hidden dangers from sharp edges at masts, steel profiles and so on need to be paid attention to! The edges can reduce the strength of the round sling by quite an amount.
At this technique it is important to know the dangers a potential fall (high fall factor possible).
For the lead climb the HMS is being used. If secured via the Gri-Gri, and one is in the safety chain, high attention is required. The body of the safety rescuer being used as a falldamper, like it is done in climbin gardens.

Not generally done in the UK, where proprietary safe slings are used to climb structures.

Procedure:

Both persons tie themselves via figure of eighth knot directly into each rope end to the harness.
Don't connect via carabiner (danger of injuries, danger of braking of the carabiner through uncorrected load)
Attach at the highest point of the harness!
Danger of uncontrolled free fall.

The lead climber takes enough round slings and carabiners with him and hangs them around the shoulder.
If necessary edge protection is taken
The safety rescuer builds a static anchorage.
The anchorage needs to have 2 different anchor points. Edge protection!
The Gri-Gri or the HMS-carabiner is attached to the anchor.

HMS-carabiner needs to be a redundant carabiner!
While using the Gri-Gri the safety rescuer attaches himself with his harness between the anchor and the carabiner of the Gri-Gri (therefore at a possible fall the fall is damped through his body).

This is not being used by special rescue groups in Germany.

The rope of the lead climber is attached to the Gri-Gri or with the HMS knot to the HMS-carabiner.
Control the attaching of the rope

The lead climber attaches the 1st Intermediate anchor at 2-3 m, the 2nd . At about 4-5 m (always less then at the 1st because otherwise he can hit the ground at a possible fall)
The next intermediate anchor can be further apart (about 4 m distances)
While setting the intermediate anchors, the lead climber secures himself via self securing (e.g. Zyper, y-sling)

The safety rescuer secures that way that there is only little slack
Note that at the HMS-securing the guiding hand and the brake hand need to be always at the rope. Wear gloves!!

When reached the top the lead climber secures himself with his safety lanyard, sets up an anchor, hauls the rest of the rope in and secures his colleague via HMS
Edge protection!

The 2nd rescuer climbs after and takes the intermediate anchors with him
When reaching the top he climbs immediately as 1st further on

Going back is done versus, note that the 2nd rescuer is at fall risk.

Basic Intervention Technique 5

Rescuing of a casualty out of a rope from height

Task:
To rescue a casualty hanging in a rope or a blocked person. The rescuer descends active or passive till above the fallen person, takes him over in his system and brings him safe to the ground.

Equipment:
Personal protective equipment including accessories, 1 dynamic rope, several round slings for attaching, carabiners with safety lock, descending device (e.g. Figure of eighth, GiGI-descending plate, Radeberger Haken, ...), edge protection, pulley system, accessory cord.

Personnel:
1 - 3 rescuer

Anchorage:
2 static anchors on 2 or more points.

Note:
Variation 1 (active descending)
It is being descended actively. Attach the rope in the middle of the rope with 2 figure of eighth knots at least a couple of meters above the casualty. Of importance is, that both ropes are attached independently.
Variation 2 (passive descending)
Safety system is done from top

While descending to the casualty it is important to stop as far as possible above the casualty, keeping enough distance to be able to release the casualty from his rope. First connecting a safety lanyard to the casualty which keeps till the end of that operation. While descending use always a safety blocking below the descending device (only variation 1). It is absolutely important to take a scissors with you to cut the rope of the casualty after taking the load out. The cutting of the rope needs to be done with great care and is done after the taking over of the casualty into the rescue system. Taking the load out is done via a pully system after taking over in the rescue system.

Note:
For the descending the GiGI-plate or the Radeberger Haken are very good because they produce very good friction (attention! For 2 persons great break force is needed). If the pulley system can not be reached anymore after the rescue, it can stay in the rope. This has no influence in the safety of the operation.
The disadvantage of variation 2 is that 2 additional rescuers (safety and work rope) are necessary and constant contact between the rescuer and the descender.

Procedure:

Variation1 :
Applying the double rope (active descending)

2 anchors for ropes via round slings (edge protection)
Control if both anchors are separate. Control if the anchors are sufficient, if not choose additional anchors!

Attach the rope from the middle with 2 figure of eight knots or 2 ropes with figure of eight knots.

Check that both ropes are independent attached! Is the figure of eight knot made correctly and are all carabiners locked?

Self securing with a safety rope

If necessary built a safety system

Lower the rope or take it with you in a rope bag

Don't forget knots at the end of the rope!!!

Attach block knot Machard or Prussik or blocking device (shunt) to the double rope

At least 3 slips/slings around

Connecting knot of the block knot shall not be positioned on the slips nor the carabiner

Attach via carabiner to the sit harness

Attach the descending device (figure of eight, GiGI-plate, HMS) above the block knot to the double rope

Check correct attachment of the double rope to the descending device (device notes)

The descending device is connected via a short lanyard to the belt (about head high)

Descending

Safety check

(carabiner, rope placement, knots, block knot in position)

If safety is at place one is going over the

Attach the pull system to the block knot

Haul the casualty till the load is out of the rope

edge and the safety rope is disconnected

While putting load on the rope, the body weight need to be brought first into the descending device and not into the safety system

Caution to the edge, danger of being blocked, edge protection. Device must not be loaded over an edge

Taking the blocking system with you

Don't grip the blocking device and block knots, only hold it with fingertips (panic reaction through griping)

Constant and slow descending

Always work on sight or via radio communication

Descending till short above the casualty

Rescuing

Stop descending

Loosen the block knot or the blocking device

Immediate attaching of the safety line to the belt of the casualty

Attaching the block knot (Machard or Prussik) around all 3 ropes above the descending device

Also the rope of the casualty shall be blocked, so that the rope of the casualty need to be taken the load of till the blocking and not out of the whole rope length.

Attaching the casualty in the carrying system of the rescuer

Descending the casualty into the carrying system of the rescuer

Loosen the casualty out of his system (cutting the rope or opening of connecting devices)

Loosen the pulley system

Descending with the casualty
Attention, more load needs more break force

Variation 2 (passive descending)

<u>Safety rope</u>

Anchor for safety system with round slings, alternative clove hitch (edge protection)
Control if the work rope and the safety rope are separate
Control if the anchor is sufficient, if not choose additional anchors!

Figure of eight knots e.g. With double loops at the end of the rope
Before tighten control the length of the loops (1 short, 1 long)
Attach the long loop to the ***upper*** part of the belt of the rescuer, rescue triangle to the short sling. Is the figure of eight knot made correctly and are all carabiners locked?

HMS at the safety rope
(carabiner needs to bee a redundant one)

Block the HMS with a slip knot
Slip close to the HMS
The opposite slip needs to go round both ropes
The HMS knot needs always to be blocked via a slip knot if one leaves the position.

Position the block knot Machard or Prussik at the safety rope on the brake side

At least 3 slips/slings around
Connecting knot of the block knot shall not be positioned on the slips nor the carabiner

Attachment is done to the sit harness or the anchor and is guided by the brake hand. It is of advantages to connect the block knot not to the sit harness, so one can get disconnected in case of a possible activation of the safety system.

Work rope (low stretch rope)

Anchor for the work rope with round sling or clove hitch, if necessary choose additional anchors!

Descending/ rescue manoeuvre
Safety check with oral examination (carabiner, rope placement, knots, safety system, short Prussik in place)

Descend to the hanging person
Securing the casualty (taking over in the safety system of the rescuer)

Place an anchor (ascender) for the pulley system above the casualty on the work rope and bring the pulley system in place

Further descending to the casualty

Make a connection via lanyard with the carrying system of the rescuer

Taking of the load of the casualty is done now with the pulley system

Loosen the casualty out of his system (cutting the rope or opening of connecting devices)

Descending the casualty into the carrying system of the rescuer
Loosen the pulley system
Descending with the casualty

Attention, more load needs more break force

Basic Intervention Technique 6

Cable way between 2 points (horizontal)

Task:
This technique enables us to move persons over inaccessible points or great high differences without problems. A descend point can be chosen anywhere.

Equipment:

Personal protective equipment with accessories, 2 ropes (safety ropes), 2 low stretch ropes (work ropes), several round slings for attachment, carabiner with safety lock, descend-block devices (e.g. Gri-Gri, stop, I´D, ...), edge protection,
Stretcher, rope throwing device, double pulleys, ascenders, single pulleys
Rescuer power:
4 rescuer

Anchorage:
Because stretching the work rope can result in higher forces, the anchors need to be chosen accordingly.

Note:
For the work rope a low stretch rope shall be used, descend and pull ropes can be weather dynamic or low stretch. If the angle is below 20° 2 work ropes and 2 safety ropes (descend and pull ropes) are to be used. One pull rope is to be installed on top one from the bottom ("forth and back"). If the descend point is more then 5 m away from buildings, tower, ... Also 2 work and 2 safety ropes are needed. If the descend point is less the 5 m away 1 work rope and 2 descend ropes are sufficient. Tension via a Gri-Gri, stop or i'd and/ or HMS in relation with ascenders. The Gri-Gri needs to backed up by a safety system and the HMS need to be blocked.

Note:
One must never over tighten the work rope. The tightening shall be done with the maximum of the force of 2 rescuer and one loose pulley. The anchor should always be above the working position.

Procedure:

Positioning of the casualty

1 rescuer goes to the opposite site (if on the opposite site there is the need to pull a ascender and a pulley need to be taken; also anchorage material is needed)
With the aid of a rope throwing device or something alike (swimming) a pull rope is brought to the opposite site.

Working on the opposite site: 1 person

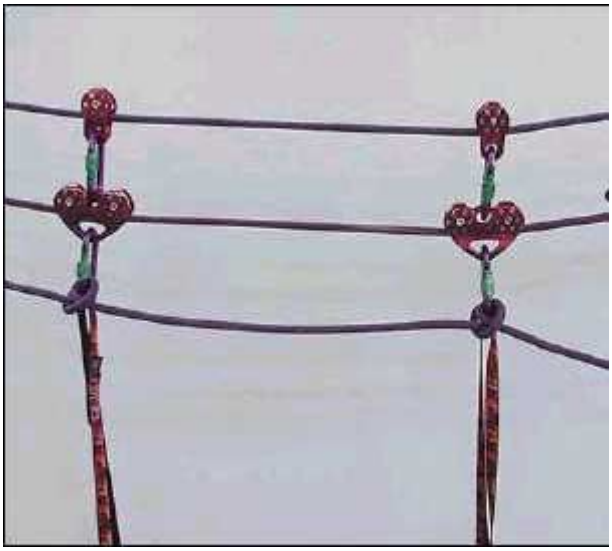
Anchor the safety with round slings (edge protection).
Control if the work rope anchor and the safety rope anchors are separate
Control if the anchors are sufficient, other wise choose additional anchors!
The low stretch work rope as well as the safety rope and the break rope are connected to the pull rope and are pulled over
The low stretch work rope is connected via e.g. HMS-knot and slip knot to the work anchor.
The safety rope is connected via e.g. HMS-knot and slip knot to the safety rope anchor
The rope (pull or break rope) is to be pulled a couple more meters and via HMS attached and via a slip knot blocked

Working on the manoeuvre site: 3 persons

Anchor for the safety with round slings (edge protection)
Control if the work rope anchor and safety rope anchor are separated
Control if the anchors are sufficient, other wise choose additional anchors!
If possible choose anchors above the exit position
Tighten of the work rope via Gri-Gri and/ or HMS in combination with ascenders and pulleys
Attention: maximum 2 persons pull with one shear

The Gri-Gri or the HMS-knot need to be backed up via a slip knot

Attention: If a vehicle is used as an anchor, hand brake needs to be applied and vehicle key held by the incident commander. Additionally brake shoes are positioned in front of the wheels



If possible position the work rope above the safety rope

Attach double pulley with carabiner and rigging plate to the low stretch work rope; the double pulley is additionally with a carabiner attached to the safety rope

The descent pull ropes are connected to the double pulley via figure of eight knot or the rigging plate.
Pulling ropes should react to the pulleys. If 2 pulleys are being used create 1 pull connection

While using a stretcher it is important that descend and pull ropes are attached to the stretcher, if the anchor and the exit point are on the same level.

.

Through the use of safety devices (e.g. Gri-Gri, I´D, ...) Fast hauling or descending is possible (loose pulley with back slip stop).

If one needs to descend e.g. Above the middle of a river, one can guide one additional rope trough the pulley. Through this a vertical movement is possible.

The stretcher needs always to be accompanied