Recovery
Due to the multiplicity of variables involved it is not possible to guarantee the success of the recovery, the safety of bystanders, participants or property.

You should attend a professional recovery course and always follow the manufacturer’s instructions with regards to your equipment and vehicle.

General safety considerations
With all recoveries the following should apply,
• A standard tow bar or tow ball is unsuitable as a recovery point
• You should have suitable, professionally fitted recovery points to the front and rear of all vehicles involved in a recovery.
• Follow equipment safety and usage instructions.
• Assess the situation and where possible make the stuck vehicle easier to extricate by digging if badly stuck in mud, or packing ruts with small rocks or branches.

Equipment
Recovery Kit Bag Keep all equipment in a single bag that is readily accessible. Never store wet and dirty equipment in a bag or mix it with other equipment such as tools or other supplies. The best bags are made of washable Cordura with eyelets to anchor gloves, breathable pockets for straps and drainage holes in the base. The bag should also have loops for shackles and inner side-wall pockets for items such as recovery blankets and links.
Shackles Use rated alloy recovery bow shackles with a Work Load Limit (WLL) of not less than 2 000kg to attach the strap, cable or rope used. (Fed Spec RR-C-271b/Factor of safety of 6:1). Pack a variety of bow shackles to cater to all vehicle weights, a good range will be from 2 Tons to 6,5 Tons to cover all situations.

We do not recommend that you use commercial or D-Shackles: a commercial shackle will not show it’s rating and the pin and body will be of the same diameter. On a rated shackle the pin and body will be of a different diameter (pin is thicker). The body
is embossed with the **Work Load Limit** and batch number. A bow of the shackle has a larger inner working radius offering more space for attachment of straps and the ability to achieve greater angles when recovering. After tightening a shackle turn the pin a half turn back, this will make it easier to open after the recovery.

**Gloves** Are essential to off-roading, gloves are not only used for winching, they offer protection from heat, dirt and even when collecting firewood. The ‘gardening’ or ‘welding’ variety often used are not recommended as a glove should fit comfortably and still allow ‘feeling’ when working. Good gloves have the following features:
- Durability – strong leather (cowhide).
- Protection – through the reinforced double palm.
- Accessibility – solid brass eyelets with a karabiner for joining and attachment to belt loops or within your vehicle.

**Ropes, Straps and Cables**
- Do not use damaged ropes or straps.
- Do not knot ropes or straps.
- Keep straps or ropes away from hot exhausts.
- Regularly inspect your equipment—especially after use.
- Straps and ropes are not to be used for lifting equipment.
- Always recover in as straight a line as possible. Use a bridle if necessary to straighten out the pull and never pull at an angle greater than 60° from the centre line of the vehicle.
- Keep participants and observers well clear of ropes, straps or cables in case of recoil due to a failure (as a rule generally twice the length of the cable, strap or rope utilised).
- Dampen cables, ropes and straps with recovery blankets (one per 5 metre of rope strap or cable).
- Protect cables from cutting or abrasion when pulling over obstacles: also check that there are no sharp edges on the underside of the vehicle that may cause a failure.
- Never step over a tensioned cable, rope or strap.

Straps and ropes should be washed after use in sand or mud to remove abrasive particles. Thereafter they should be dried in a cool dry area prior to packing as the fibre is sensitive to UV rays.
A strap from a reputable manufacturer should have a label stitched in, detailing not only compliance to SANS 94 but:

- Manufacturers name
- Technical spec
- Instructions
- Material
- Strength
- Length
- Application
- Work Load Limit (laden vehicle mass)
- Factor of safety and/or the minimum breaking strength.

NB: An unlabelled strap should not be used. It is important to note that 10% of damage to a strap equates to a 50% loss of its rated capacity.

Your strap should be purchased in accordance with the vehicle you drive in terms of the maximum laden vehicle mass. End loops should be well constructed with a loose, movable sleeve to prevent wear and tear and allow full protection.

Pull/Winch Extension Strap – (first line of defence) Made of low elongation, high tenacity polyester with limited stretch. The strap is used to pull or tow stuck vehicles through or over an obstacle in a controlled fashion. Always attempt to recover in a straight line. After securely attaching the strap to both vehicles take up the slack. The recovering vehicle then moves off at a moderate pace to start the recovery. Movement should be gentle without any jerking. In an absolute emergency a Pull Strap can be used as a tree trunk protector and to lengthen a winch cables reach.

Kinetic Energy Snatch Straps and Ropes (your last line of defence) Made of high elongation, high tenacity polyamide, and most kinetic straps elongate between 20–25% of their original length, converting potential energy into kinetic energy. This is a dynamic elastic rebound and is used to recover a badly stuck vehicle from sand or mud. The strap is normally laid out on the ground in an S formation (about 2 metres). The recovery vehicle moves away off normally in 1st gear, low range in a straight direction away from the stuck vehicle and extends the strap to its maximum elongation. Try to stop your vehicle before the strap stops you, this allows maximum utilisation of the kinetic energy without shock loading the strap or rope and overloading the vehicle recovery points. If the vehicle is still stuck a new rope or strap may have to be used, alternatively the vehicle may need to be winched out.
The kinetic energy recovery rope is used similarly to recover severely stuck vehicles from sand or mud, possibly after a kinetic strap. The rope is an ultra-high elongation, high tenacity, plaited polyamide rope and can elongate 30–40% of its length. Once used it should be loosely piled to recover its kinetic capability, do not immediately pack it away.

In both cases recovery from rest to re-use is once in 24 hours. Kinetic Energy Snatch Straps and Ropes are generally regarded as the last line of defence.

Kinetic straps and ropes should never be used to anchor a winching operation or extend a winch cable.

**Kinetic capability** (strap used as an example). As a rule, after one snatch, the kinetic capability has been *used up* and the strap requires eight hours for every 10% of stretch to *creep back* or be restored to its original capability, 25% requires 24 hours rest.

A 10% stretch on a 10 metre strap would be one metre. The reduction in elongation is affected by usage and age. For example, when such a strap has stretched to 13 metres and no longer returns to its original length, it has lost its kinetic capability. It could still be used as a *pull strap* in an emergency.

There are two phases to the recovery of a strap: namely, the latent phase, which is over time, and an immediate phase when the strap rebounds, restoring a small minimal kinetic capability.
It is important that you should understand that maximum elongation is also the point where a failure could occur!

**Important Factors Influencing Kinetic Capability**

- Mass of the two vehicles.
- How *stuck* the vehicle is. The rope or strap utilised should be rated according to the mass of the stuck vehicle.
- Traction available to the recovering vehicle — in other words, the road surface. A speed of 18Kph is suggested in the case of two vehicles of similar mass.
- The distance between vehicles and the speed at which the recovery vehicle moves.

**Tree Protector Strap** The tree trunk protector is designed to protect the bark of a tree when using a winch or rerouting a cable from a tree with a snatch block. In all situations it provides a safe, secure anchor point. The tree trunk protector should be more than 75mm wide, and 2—5 metres long. It should be placed as low down as possible on the base of the tree. Avoid jerks and movement which will damage the tree's bark.

**The Recovery Link** Only join straps and ropes with the same rating and type. To ensure that the fabric which makes up the *eyes* of the rope or webbing does not bind onto each other due to the force of the recovery, a link is inserted between the two eyes to separate them. This is made out of multiple layers of webbing tightly stitched together. The rigid link takes the place of the traditionally used branch or newspaper and what’s more it has a retention strap with a quick release fastener to ensure
that it stays in place whilst the straps or ropes are not yet under tension. It is not safe to join straps or ropes with a shackle. Should a failure occur the shackle will become a deadly missile!

**Recovery Safety Lanyard** Used when recovering vehicles for added safety in the event of a strap, rope or cable failing. It is made of low elongation (5%) high tenacity polyester webbing and is attached to the vehicle and over the strap, rope or cable by two loose ring hitch knots, it is not attached to the same point as the bridle or strap/rope/cable used. The suggested length is 1,4 metres.

**Recovery Bridle** Spreads the load across two anchor points when recovering a stuck vehicle in much the same way as if one had done this with a choker or drag chain. However as it is made from low elongation (5%), high tenacity polyester webbing which is softer on vehicles in the case of a rebound. The safe option is to use the bridle in conjunction with two lanyards. The suggested length is 3,5 metres and it should have reinforced eyes on each end with a moveable encapsulated sleeve to protect the area where one fits the rope or strap. The bridle is attached to the vehicle with rated bow shackles.

**Recovery Blanket** Dampens the shock in the case of the failure of a strap, cable, shackle or recovery point. The unit is like a tube and is fitted over the recovery equipment in use (rope, strap or cable), the compartment at the base is filled with sand to provide the weight that dampens recoil in the event of a failure. One must carefully evaluate the number of blankets required:
if doing a vehicle to vehicle recovery one blanket should be used per 5 metre of strap, rope or cable, if multiple points are used in winching with snatch blocks more blankets would be required.

The Hand Winch  Cheaper than an electric unit and portable. When not in use, the cable, handle and winch can be stored out of the way. The typical unit comes with a cable and a handle for winching in and out. Jaws in the winch grip and move the cable as the handle is cranked. All safety procedures should be followed. A snatch block can be used in conjunction with the winch. To lengthen a cable, you can use a pull strap. A hand winch is a highly effective piece of equipment but it requires manual effort.

Operating safety comes with the shear pins built in to the crank. Replacement pins are contained in the handle. Use recovery blankets when winching and observe their position as the cable approaches the winch.

Hand winches can pull at a variety of angles as well as from the front or rear of a vehicle and do not depend on battery power.

The Snatch Block  Can be used to change the direction of your winch cable if you need to winch in a straight line or when line splitting (see winching),

Always ensure that you have spare circlips for your snatch block. It is best practice to use a snatch block that does not have an exposed wheel.
The Drag Chain  Also referred to as a *choker chain* the drag chain consists of a length of round, welded, steel-link chain with two removable clevis-type grab hooks able to link back over the chain and lock in place. Typical uses are:

• Where recovery points do not exist, the chain can be locked around the chassis on both sides to form an inverted ‘V’. In this way both sides of the chassis share the load.

• A section of chain can also be used with a high-lift jack if no high-lift point exists for attachment to an off-road bumper or tow ball.

• The chain can be used to anchor off large rocks for recovery.

• Towing in emergency situations (as a last resort).

• The chain can be tied around obstacles such as trees which have to be moved. Do not use a strap for this as you are likely to chafe the webbing.

A drag chain should be labelled, showing that it is rated and tested as well as detailing its batch number and manufacturer’s identification. The minimum breaking strain should not be less than 8 000 kg and should be a minimum of 3,5 metres long.

Winching
For electric, hydraulic or any other type of winch we suggest you refer to the manufacturers operating instructions before using. The following guidelines will however be useful in the bush.

On installing a winch if you have a steel cable it will still be in a loosely woven state on the drum. It is advisable to unspool it and pre-stretch it under load to tension the cable which will reduce the risk of it *binding* onto itself in use. At the same time this dry run allows you to get used to the winch and its operation.

Always pay attention to the manuals safety instructions as well as general recovery safety protocol, you are using mechanical equipment and the dynamics place the winch, mounting points, attachment points and cable under severe strain.
The Main Winch Components Are:

**The cable** This could be a steel cable or plasma rope, its length and thickness will be determined by the rated capacity of the winch. It feeds through the fairlead rollers and is looped at the end with a clevis hook. The fairlead guides the cable onto the drum and minimises the risk of damage to the cable.

Before and after winching, inspect the cable for damage, a kinked or frayed cable should be replaced as it will no longer operate at its rated capacity. Never hook the cable back onto itself as it will cause damage. Use a tree protector or other attachment point. Unwind as much cable as possible even if you have to double line the cable, or attach it far away from the vehicle, as maximum pulling power is on the first layer of rope on the drum. Never winch with less than five full turns of cable on the drum. Winches can also run synthetic *plasma* ropes instead of usual steel cable. There are advantages and disadvantages to both. It’s up to you to evaluate your requirement before changing.

**Plasma Rope Is Made From Ultra High Molecular Weight Polyethylene Fiber (UHMWPE)**

- Some *plasma* ropes can degrade with the heat caused by the brake within the winch’s drum.
- Steel winch cables are prone to kink, rust, and have very sharp strands once damaged.
- *Plasma* ropes are easier to handle and store.
- *Plasma* ropes are more susceptible to sharp edges (bumpers and rocks in particular) but are stronger and safer.
- Being lighter also makes them safer in the event of a failure, when released they virtually fall to the ground.
- *Plasma* ropes are more expensive than steel cable.

**The Control Box And Remote Control** Transfers electricity from the battery to the winch motor. The remote control plugs into a control box allowing you to control the winding direction and stand clear of the recovery. Position youself behind the driver’s door
with the bonnet up or remain seated. This allows you to use the vehicle’s foot brake to anchor your vehicle. You must always be in control of the remote and it should only be plugged into the control box when winching commences.

**Gears** The reduction gears convert the motor's power into a pulling force at its rated capacity on the first layer of cable on the drum.

**The Motor** In an electric winch the motor is powered by the battery and using the gears turns the drum, winding the cable.

**The Drum** The drum is a round cylinder onto which the cable is wound. A brake is housed inside the drum, it engages automatically when the motor is stopped preventing the cable from winding out.

**The Clutch** The clutch disengages the drum from the gears or engages the gears allowing the drum to rotate freely (free-spooling) or to be locked. The clutch should never be disengaged if the cable is under tension (winch is under load, i.e. live)

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**Operating A Winch**

- Assess the situation, look at the recovery points and clear any obstructions.
- Always wear leather gloves to protect your hands.
- Disengage the clutch to unwind the cable—this will save your battery. Pull the clevis hook out using a hook strap.
- Wind the cable off the drum to a suitable recovery point. This may be a natural anchor such as a tree or in the case of a vehicle to vehicle recovery a professionally fitted recovery point. When using a tree use a tree protector.
- Anchor the winching vehicle by means of its handbrake. The vehicle should not be in gear.
- Secure the cable to the recovery point. Use a rated alloy bow shackle. Once tightened, slack off a half turn. Position the shackle pin at right angles to the direction of pull. This will ensure that you can loosen the pin after winching (it may stretch under load).
• Engage the clutch by switching the lever, this locks the drum.
• Connect the remote, keep the cable clear of the winch and fairlead, if winching from within your vehicle, lay the cable out so that it can not foul and pass it through the vehicle window.
• Take up the slack by slowly tensioning the cable. The cable is now *live* and dangerous, bystanders should be clear (at least twice the length of the cable) no one should step over the cable. Dampen the cable using recovery blankets (at least one per vehicle, two if using a natural anchor). When line splitting more may be required.
• Check the rigging once more prior to proceeding. If using an assistant to guide you, ensure that clear hand signals are used.
  1 Indicate *winding in* with a hand above shoulder height and turn your hand in an anti-clockwise direction.
  2 Indicate *winding out* with your hand at waist height turning it in a clockwise direction.
  3 For an intermittent pull, close and open your thumb onto your forefinger.
  4 To stop winching, hold your fist up above your shoulder.
• Avoid pulling at an angle as the cable will wind up in a bunch to one side of the drum which could damage the cable or winch, this also decreases the rated capacity. If you need to straighten the cable out it may be necessary to do an angled pull using a snatch block.
• Winch with smooth movements and avoid jerks, the shock load can cause damage.
• Once the vehicle is on stable terrain, the recovery is complete.
• Ensure that there is slack in the cable and it is not under tension.
• Disconnect the cable.
• Check that the cable is neatly wound onto the drum, if uneven, it may be necessary to rewind the cable.
• If rewinding, guide the cable back onto the drum using a hook strap. Keep the cable under tension and walk the cable back onto the winch. Either attach the hook to a suitable recovery point or tension between the fairlead rollers.
• Disconnect the remote and store it in a safe place.

A Few Tips
• Keep hands and clothing clear of winch components.
• Do not move the winching vehicle whilst winching as you could overload the winch.
• If the recovery is a difficult, pause to allow the winch to cool down and allow the engine to recharge the battery.
• If recovering a heavy vehicle, unload as much weight as possible to make recovery easier.
• For self winching without an anchor point a steel stake, sand anchor or a spare tyre (buried deeply) may be used.

Winching in a straight line which allows the cable to wind onto the drum neatly, if this is not possible, use a snatch block secured of a point in front of your vehicle and re route the cable at 90° to another attachment point or vehicle.

Using a snatch block also allows you to increase the pulling capacity of the winch (although it reduces line speed) Double lining allows you to pay out more cable and use the rated capacity of the winch, both lines should be parallel to achieve maximum power.

Triple-lining will increase power over a double lined set up, the extra power may be required in a situation where a vehicle is difficult to extricate.
The most common option with a snatch block is double-lining, which is simply running the cable out to a fixed pulley, then back to a solid tow hook on the vehicle. This gives you two lines pulling at the rated capacity of the winch but halves the line speed. Don't forget to use a recovery blanket.
The next step is triple-lining, which will increase the power of your winch over a double-line setup. It also reduces line speed, but the increase in pulling power may make it worthwhile. In addition to needing a tow hook on your vehicle, triple-line rigging requires two snatch blocks and two anchors. Don’t forget to use a recovery blanket.
This is a variation of the ‘triple-line’ setup that uses the angle-pulling technique from a second anchor on another vehicle. If you're able to reel out enough cable, your winch can rescue another 4x4 in just about any predicament, even when you can't get in line for a near-straight pull. Don’t forget to use a recovery blanket.