

The Use of AB Chance Series 90 Capstan Winches



Image courtesy AUS Ltd

MATS Group Safety Bulletin

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1 Introduction

This bulletin is aimed at those parties that have responsibilities for lifting operations on broadcast and telecommunications structures.

2 Purpose

The purpose of this bulletin is to ensure that capstan winches are used safely by taking into account the specific risks associated with their design and with the nature of lifting operations on broadcast and telecommunications sites.

3 Definitions

3.1 Series 90 Capstan Winch

For the purposes of this bulletin the capstan winch referred to is a 1000lb rated, electrically powered winch from the Series 90 range. Series 90 capstans are exclusively used for lifting materials and must not be used for lifting persons. AUS Ltd are exclusively the distributor of the Series 90 winches within the UK.

4 Determining Suitability

As limited information is available to support the derivation of the working load limit marked on the Series 90 capstan winch, i.e. factor of safety used, it is important that a precautionary approach is applied. Therefore when used on masts and towers, the MATS Group recommends that an additional 2:1 factor of safety be applied.

Consideration must then be given to the load and activity specifics in order to identify what load can safely be lifted or lowered.

4.1 Calculation to Determine if a Series 90 Capstan Can Be Used

The following calculation should be undertaken to determine whether a Series 90 capstan winch is capable of lifting or lowering the proposed load:

- The MATS Group recommends (and some individual companies may mandate) a 2:1 factor of safety on all Series 90 capstans. Hence, take the marked working load limit on the winch and divide by 2.
- Count the number of pulley blocks that are planned for use in the rig (omit those that are there simply for 'holding off' purposes). For each pulley block calculate 10% of the load to be lifted and subtract this figure from that determined in point (a) above.
- Next calculate the wind loading using the table below. This is only applicable for dishes; if you are lifting steel work or sector antennas wind loading can generally be ignored in your calculation.

Dish Diameter (m)	Gust load (kgf) at Lift Height				
	10m	30m	45m	100m	200m
1.2	19	25	27	31	35
1.8	43	57	60	71	80
2.4	77	102	107	127	142
3.0	120	160	166	198	222

- d) Subtract the wind loading figure from the figure determined in point (b) above. This will provide the maximum weight of the load that can be lifted, ie a safe working load for the task.

4.2 Dish Lift Guidance

With consideration to weight and wind speeds, the table below provides guidance regarding what dishes can be lifted/lowered using a Series 90 capstan winch and to what heights:

Dish Size (Diameter)	Height of Lift:				
	10m	30m	45m	100m	200m
0.6m	✓	✓	✓	✓	✓
1.2m	✓	✓	✓	✓	✓
1.8m	✓	✓	✓**	x	x
2.4m	x	x	x	x	x
3.0m	x	x	x	x	x

** For clarity a 1.8m dish can be lifted to a maximum height of 45m and not beyond that.

4.3 Alternatives

A 3000lb capstan winch is available in the Series 90 range. The use of this winch requires additional controls due to the load applied to the structure at the capstan anchorage and at the top pulley position. The additional controls required would include the demonstration by the proposed user that calculations have been undertaken and that the integrity of the structure would not be affected by use of the capstan.

If it is determined that a Series 90 capstan cannot be used to lift or lower the load, an alternative winch must be used such as a drive-on, drive-off erection winch.

5 Safe Use of Capstans – Setup

5.1 CE Marking

To be compliant with the supplier's EC Declaration of Conformity, all Series 90 capstan winches used must have been subject to the appropriate electrical conversion works and must be used in conjunction with the AB Chance rope-lock device for lifting and lowering operations.

5.2 Fibre Ropes

It is important that the correct type of rope is selected which is low stretch and has good gripping properties. The rope lock device, which is mandatory for lifting/lowering operations, accepts rope sizes from ½" – ¾" diameter only, so rope sizes must be within this range. A composite fibre braided rope, such as a 16mm Marlow with 6650kg MBL, is recommended by the supplier. Selection of the incorrect rope could lead to excessive heat build-up and failure due to the rope slipping round the drum.

5.3 Anchor Points

Due to their lightweight and portable nature, the safe operation of Series 90 capstan winches is heavily reliant on attachment to a suitable anchor point. When lifting/lowering equipment on a tower, a tower leg can be used. When lifting/lowering equipment on a mast, it may not be possible to anchor to the structure due to the tapering nature at the bottom; this should be accounted for at planning stage.

Series 90 capstan winches can be anchored to vehicles but only when used in conjunction with a purpose made bracket supplied by the winch supplier or

manufactured by a competent engineer (and supported by design calculations). In addition, the users must satisfy themselves that the vehicle and tow bar are capable of taking the loads imposed.

When a bracket and tow bar are to be used as an anchor point the user must ensure the rope is in line with the tow bar and not at an angle, the weight of the load being lifted/lowered is not too great for the vehicle etc.

Gates and fence posts should not be used as anchor points.

5.4 Pilot lines

At heights above 45m the lifting operation must include the use of a fixed pilot line to keep the load away from the structure. Holding out lines or taglines may not be sufficient above this height due to difficulties in controlling the load and the additive loading effects on the winch.

5.5 Time Allocated for the Job

There are limitations on the speed that the fibre rope can travel around the Series 90 capstan winch drum. If the job involves a number of lifts/lowers a rough calculation should be undertaken based on the height of the lift/lower and an average travel speed of the rope (see manufacturer's instructions). This should enable the team to ensure there is sufficient time allocated for the job to be completed.

5.6 Weather Conditions and Wind Speed

Regardless of all prior planning if weather conditions on the day of the job are inclement, eg wind, rain or fog reducing visibility then work should not go ahead.

Series 90 capstans should only be used where average wind speeds at 10m (in open terrain) are no greater than 15mph with maximum gust speeds at the same level not exceeding 30mph.

5.7 Communications

A second person may be required to assist the Series 90 capstan operator with radio or signal communications when the operator cannot see the load and where voice communications are inadequate due to distance between parties, weather conditions etc. The capstan operator may not be able to use radios or hand signals when operating the winch.

5.8 Electricity

Series 90 capstan winches are generally powered electrically through mains power or diesel generator; the supply must always be a reduced 110v supply. Where transformers are plugged into site power sockets, trailing cables must be suitably protected against damage and arranged so as to not constitute trip hazards to people on site.

6 Safe Use of Series 90 Capstans – Operation

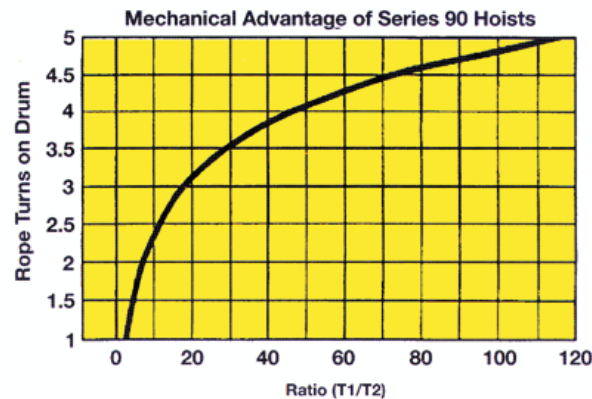
Series 90 capstans must only be used by trained operatives and in accordance with the manufacturer's instructions. The following is therefore intended as safety guidance and not as instructions for use:

6.1 Rope turns on the drum

The operator must never add or remove turns of rope while a load is suspended and should use the same number of turns to lower a load as is required to raise the load. The number of turns used should be dictated by the weight of the load but a good guide is to select the number of turns which will allow control of the load with 20lb (9kg) to 40lb (18kg) pull by the operator on the fall line.

Example: 3 wraps of rope = 1:20 ratio. That is, 1kg pull on fall line develops 20kg on load line. Therefore, 10kg of pull develops 200kg of lift.

The manufacturer's instructions should be referred to for calculating the adequate number of turns (see excerpt in figure below).



Source: Hoist Safety, Hubbell Chance, 1996

The operator must never allow the drum to rotate without advancing the rope, as heat will build up quickly and could melt the rope.

6.2 Use of Rope Grab

The rope grab is intended as a 'holding' and secondary arrest system in the event that the capstan operator cannot maintain pull on the fall-line for any reason (e.g. accident or illness); the rope grab must therefore always be used for lifting and lowering operations.

When the load is being lifted, the rope grab acts in a passive capacity and will lock off when the operator ceases operation of the power foot control unit and releases pull. During lowering operations, the rope grab must be held open by the operator, meaning the operator cannot maintain a 'hand over hand' control over the pull line. During significant lowering operations, a second person must assist the operator by holding open the rope grab or by providing a second pair of hands on the pull line.

6.3 Operator Position

The operator will often be close to the structure due to the capstan being anchored to tower legs etc. The rig should be arranged so that the operator is never directly beneath the suspended load during the lifting/lowering operation.

The information in this document does not absolve contractors or suppliers from their responsibility to identify and comply with all relevant legislation, regulations and legal standards nor does it take precedence over laws, regulations and external standards.