

## **GENERAL INSTALLATION, SHIPPING, HANDLING & STORAGE PROCEDURES**

### **SAFE HANDLING OF CABLE DRUMS**

It is recommended that the safety rules of an establishment, relative to cable drums, should follow the guidance given unless practices equal to or better than those quoted are in being.

#### **1. GENERAL PRACTICES**

- 1.1 Never use a lifting device or transport device for a weight which exceeds its permitted capacity.
- 1.2 Never use a lifting device or transport device for a purpose for which it is not primarily intended unless a professional ruling approves such use.
- 1.3 Ensure that all precautions in common use are supervised adequately. Where the load is unusual and is likely to need special care, ensure that all precautions are properly checked before the transport is allowed to move.
- 1.4 Never allow an unauthorised person to operate any lifting device or a mechanical transport. Prohibit the use of all such equipment as unauthorised passenger conveyors.
- 1.5 Drums must never be stacked. Drums must be stored/transported on the roll i.e. flanges at 90<sup>0</sup> to the horizontal and never lying flat on the flange. Wood chocks should be placed under the flanges to prevent accidental rolling.
- 1.6 Marking as per project specification.
- 1.7 Cable Drums are impregnated with preservation solution and are ISPM treated if required.
- 1.8 All cable drums should be inspected immediately on arrival at site to ensure no damage has occurred during transportation and storage. It may be necessary to tighten the flange retaining nuts / bolts see point 2.4f.
- 1.9 Any damage noted should be notified immediately and in the case of Ex works or FCA delivery conditions the clients nominated shipper must be advised directly. BTC take no responsibility any damage how so ever caused for Ex works or FCA shipments after the goods leave BTC factory site.

## STANDARD WOODEN DRUM

Material : wood ( Treated to ISPM standards on request )

Flanges : 2-ply, 90° cross grain

Barrel : reinforced with through-going bolts the number of bolts depends on  
the size of the drum

Center hole : each drum has a center hole (spindle)

Construction subject to change without notice

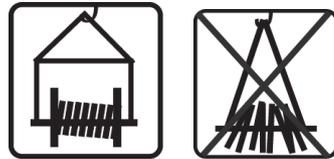
## **STANDARD WOODEN DRUM, PACKED, WITH LAGGING**

1. Lagging is nailed to the drum.
2. 2 or 3 hoop-irons are applied over the lagging to ensure the tightness to the drum.
3. The sealed inner cable end exits through the flange, which makes it possible to test the cable on the drum.
4. The drum may be lifted by forklift truck, or through the center hole (refer to 2.1b).

## 2. RECOMMENDED PRACTICES (CABLE DRUMS)

### 2.1 Whilst Loading or Lifting

- a. Lift wherever possible, using equipment which has been specifically designed for lifting cable drums, avoid using compromise arrangements unless professional approval is given. Avoid rolling wherever possible, except in situations (e.g. a loading bay platform) where rolling is the correct procedure (see 2.3 (a) below). Where ramps are necessary, ensure drum movement is always under control.
- b. When lifting drums by crane and a spindle-type bar, use only bars that have been approved for use with the specific sizes, weights, diameters and widths of the drums (lifting equipment manufacturers should be consulted regarding the specification of the bars).



- c. Collars should be fitted to bar ends to retain hooks or slings, unless they are constructed with suitable alternative devices, particularly if a spreader beam is used. When using a spreader beam, ensure that it is of the correct weight capacity and length for the weight and width of the drum.
- d. Fork lift and boom devices should be used only in the manner for which they are intended unless approved as under 1.2 above. Drum flanges, in the vertical position at right angles to the fork, should always be wider than the fork.
- e. Booms should always pass completely through the spindle hole of the drum.
- f. The adaptation of fork lift trucks to handle special or awkward loads, including the lifting of drums by spindle-type lifting bars and the use of shoes or extensions, should be discussed with the truck supplier first. Discussions should cover the design and construction of modifications and the effects upon the stability and safe working load centre is changed by their use.
- g. It is recommended that handlers should wear stout gloves. Safety footwear and safety helmets should be considered where appropriate. Gloves with stapled palms should not be used in order to avoid hazards caused whilst rolling drums. Gloves should be designed or worn so that the cuff will not become caught in the rolling drum.

- h. Under no circumstances should drums be dropped directly to the ground from heights, including the sides or ends of vehicles. Lifting equipment and/or a safe system of work should be used that will avoid the risk of injury to persons or damage to cables, drums or property.

## 2.2 Mechanical Transport

- a. This should always be appropriate to the required work.
- b. The drum should be chocked, lashed or otherwise secured, so that it is safe both at rest or whilst moving, including tail board lift devices.
- c. The recommendations on fork lifts etc are as in 2.1 (d) and 2.1 (f) above, for operator safety wear.
- d. For seafreight we recommend that the cable drums are containerised prior to shipment. Loose shipment of drums should be avoided.

## 2.3 Manual Handling

- a. Operatives should be properly instructed on the safe rolling of drums, both full and empty, that is:-
  - (i) always keep a look out
  - (ii) always push in the direction of travel
  - (iii) never pull with back to direction of travel
  - (iv) push squarely on the flanges: wearing stout gloves is advised. See recommendations concerning gloves in 2.1 (g) above; and
  - (v) to change the direction of travel, use a turntable wherever possible. Turntables should be relocked after use. Where other methods are used, they should constitute a safe working practice and persons involved should be trained accordingly.
- b. Under no circumstances should a drum be pushed and when released, it travels uncontrolled.
- c. Ensure that authorised equipment is used when rolling drums. DIY equipment should be prohibited.

- d. Any timber and battens containing protruding nails should be stacked away from gangways in suitable containers.

It is advisable to draw or flatten nails where the battens have to be left at the place of removal.

- e. Operatives should never walk on top of cable drums so as to avoid damaging wooden battens and to eliminate the risk of falling off.

#### 2.4 Drum Storage

- a. In deciding upon storage areas consideration should be given to the contour and firmness of the ground, the sizes and weights of the drums and restricting them from movement when stored. Account should be taken of environmental conditions that may affect the surface of the ground, the serviceability of the drums, battens or chocks.
- b. To eliminate unsafe movement, drums should be secured and chocked at floor level, taking into account the factors in 2.4 (a) above.
- c. When moving drums in and out of store, the recommendations given in 2.1 above should be followed.
- d. To avoid the continuing use of drums that have deteriorated to the point where it would be dangerous to keep them in service, a proper system of inspection and action should be followed. This should include the regular inspection of drums that have been left in open stock yards for long periods.
- e. All cable ends must be fully sealed at all times to prevent the ingress of water.
- f. All nuts and bolts should be checked and tightened after transportation to site and at regular intervals during storage to compensate for the possible shrinkage of the timber especially in hot locations. A torque wrench should be used with the following settings Drum size 500 to 1400 mm 85 Nm, Drum size 1600 to 2000 mm 105 Nm

## 2.5 Cutting and Coiling for Drum in Drum Racks

- a. Racks should be of sound construction and design. They should be fixed securely to prevent their being pulled or knocked over.
- b. When mounting drums into racks, use only approved spindle bars drum shafts with a capacity for the weight of the drum. Ensure that the spindle bars/drum shafts are securely located in the nearing spindle holders, to prevent their becoming unseated whilst work is in progress.
- c. Drums in the upper tiers of drum racks should be mounted so that the lead end of the cable is drawn from the under side of the barrel. Those on the bottom should be mounted so that the lead end is drawn from the top.

- d. (i) During the cutting operation, a hazard may arise owing to the cable forcing its way through the cable hole in the flange of the feeder drum as it rotates. If the tail end is fastened down, the cable forced out starts forming a loop which, if allowed to continue to grow, could become damaged or entangled with the rack or fittings. Similarly, the same possibilities arise if the tail end is not fastened down and starts to lengthen. Alternatively, if the cable movement through the hole is blocked by placing a cover over the hole, a loop may be forced out on the barrel of the feeder drum which, if left unattended, will resent the same problem.
- (ii) Further hazards may arise if the run-off of the last convolutions of cable on the feeder drum are not controlled to prevent whiplash as the last convolution is drawn off the drum, or snatch if the tail end is fastened to the drum.
- e. Safety precautions should be taken and a safe system of work set up to minimise, as far as is reasonably practicable, any risks arising from this operation. They should take cognisance of:-
  - (i) The peculiarities of the individual rack design, parts and fittings, that may provide an anchor point for a loose or looped cable to become attached to, which might move or damage the rack, the cable or the cutting and coiling machines, or cause the drum to eject.
  - (ii) The design and construction of cutting and coiling machines and their emergency stop controls or safety cut outs, and procedures for periodically testing and maintaining them.
  - (iii) Plant layout, taking into account the design and construction of the racks and cutting and coiling machines, the provision of a safe working station for the operator and his/her clear field of vision of the area of work and the work in progress.
  - (iv) Procedures for keeping the working areas free from obstructions and for prohibiting persons other than the cutting and coiling machine operator from entering it whilst cutting is in progress.
  - (v) Methods for dealing with looping and for controlling the run off of the last convolutions of cable from the feeder drum, including a stage at which the cable tail end fastenings are released.

- (vi) Arrangements that will entail cutting and coiling machine operators checking the feeder drum periodically during the cutting sequence to ensure that there are no potential snags to free running (e.g. loops forming, etc) and their taking corrective action when required.
- (vii) The provision of platform ladders for operators to use when attending to drums in the higher tiers of racks; and
- (viii) The wearing of eye protection, safety helmets and gloves.

### 3. **SPECIAL INSTRUCTIONS**

Under no circumstances should any repair or maintenance work be permitted on any crane or lifting device whilst it is in use.

### 4. **ISOLATION OF OPERATING POWER SUPPLY**

Isolation of operating power supply should be carried out first, wherever possible and warning notices posted until the crane is cleared for use.

Precautions are also necessary where repair or maintenance work of any other kind takes place in the path of the crane, to avoid risk of accident. Access to another crane which creates risk due to crane movement should also be covered by a safe procedure.

### 5. **CASE GRABS**

Cases do not roll and therefore do not create the same hazards as do drums. The main safeguard is concerned with the lifting arrangements. Lifting arrangements by fork lift devices are unlikely to create hazards, but where cases are lifted by hoist or by crane, properly designed case grabs to transport cases should be in position before the lifting mechanism is started. Make-shift devices and in particular single straps, should be avoided. It is particularly necessary to ensure that spikes in grabs are kept sharp enough to provide the proper degree of grip.

## INSTALLATION AND HANDLING RECOMMENDATIONS REEL (DRUM HANDLING, SHIPPING AND STORAGE)

- ❖ When full reels are transported by fork truck, the hub axis should be parallel to the direction of travel.
- ❖ Full reels shipped in any type of carrier should be placed in line and securely blocked at each end and along the sides.
- ❖ When lifting full reels by crane or hoist, a chain or cable sling with a spreader bar and hub shaft should be used. Never lift the reel by threading the chain or cable through the hub or with a sling around the lagging.
- ❖ Full reels should always be kept in the upright position.
- ❖ Rolling of reels is not recommended. Avoid setting reels on, or rolling over rough ground, or other surfaces.
- ❖ Lagging should not be removed until the reel is positioned in pay off equipment. Before starting to pay-off, ensure that inside surface of reel flanges are free from loose nails or other projections. Any protection plate and securing ties should be removed from the inboard cable to allow free movement of the cable to avoid distortion of inner turns on the drum.
- ❖ If reels are to be stored for an unusually long period, they should be covered so they are not directly exposed to the weather.
- ❖ Dropping of reels should be avoided at all times as the impact may damage the reel and displace the cable. When unloading from the back of the carrier in the field, a ramp or mobile crane should be used.
- ❖ When manhandling a reel, a bar should be extended through both hubs so that each takes its share of the strain. Reels should not be stored where flash floods are likely to occur.
- ❖ It is assumed that the design of installations and the specification, purchase and installation of cables is entrusted to suitable skilled and competent people and that the appropriate installation equipment is available i.e payoff equipment for large drums, cables rollers, the correct diameter of spindles etc
- ❖ In cases of doubt as to the suitability of cables for a particular use, further specific information should be obtained from the manufacturer.
- ❖ Consideration should be given to any restrictions which may exist on site with regards to the maximum weight and size of drums which can safely be handled, large drums may require cutting into the required individual drum lengths from the master drum using suitable equipment in a safe designated location depending on any installation restrictions.

### ENVIRONMENTAL APPLICATION

6. Reasonable protection against mechanical damage, appropriate to the choice of cable and the installation conditions, should be provided.
7. When cables containing PVC are exposed to the effects of external fire, they will produce harmful smoke and fumes and where bundled together may propagate fire. Where circumstances dictate, consideration may be given to the use of reduced propagation sheathing materials.
8. Cables may be harmed by exposure to corrosive products or solvent substances, especially petroleum based vapours.
9. Special preparations are required when cables are to be installed in areas classified as hazardous and reference should be made to the manufacturer.
10. The manufacturer should be consulted if the cable is to be used for a purpose it was not specifically designed for.
11. If cables are exposed to localised heat, solar radiation or high temperature conditions, this will reduce the current carrying capacity.
12. Standard sheathing compounds supplied on cables do not provide protection against damage by rodents, termites etc or long term exposure to U.V. radiation additional protection against these requirements can be provided if specified by purchaser at time of quotation.

### INSTALLATION

13. Cables being layed in trenched MUST be layed on fine graded sand with no sharp stones or other obstructions which may cause damage to the outersheath. After laying the cable should be protected by suitable covers to protect the cables from back fill this should be as aminimum a layer of 30 cm of fine graded sand or 15 cm of fine graded sand and concrete cable covers.
14. Precautions shall be taken to avoid mechanical damage to the cables before and during installation. It is imperative that the cable are pulled in such a way as to avoid longitudinal twisting as this action working against the lay direction of the armour can cause the effect known as “ bird caging “ and this action in extreme instances can initiate stress fractures in the outersheath in particular if the cable sheath is LSZH material and the ambient or sheath temperature is above 50 Deg C i.e if installed in direct sunlight in reagions of high UV radiation levels. For desert or extreme installation conditions the manufacturer should be consulted for the correct compound selection. I.E. Desert Grade LSZH/Artic Grade PVC.

15. Exceeding the manufacturers recommended maximum pulling tensions may result in damage to the cable. It is recommended that cable pay off machines specifically designed for this purpose are utilised to ensure smooth and safe installation.
16. If cables are to be installed in ducts, they must be free from any sharp objects and the cable suitably guided into the duct in such a way to avoid the sheath coming in contact with the open end of the duct and the correct size of duct should be used taking into account the relevant filing factors as per individual site / country regulations.
17. The type of jointing and filling compounds employed must be chemically compatible with the cable materials.
18. The cable support system should be such as to avoid damage or danger under normal or fault conditions.
19. Cables that are designed for fixed installations only should not be used as trailing or reeling cables.
20. Repeated over voltage testing can lead to premature failure of the cable.
20. Some compounds used become increasingly stiff and brittle as the temperature decreases with the result that if a cable with PVC components is bent too quickly or is too small a radius or is struck sharply at temperatures in the region of 0°C or lower, there is a risk of shattering the thermoplastic components. Therefore, to avoid risk of damage during handling, it is desirable that these cables are installed only when both cable and ambient temperatures are above 0°C and have been for a minimum of 24 hours. Cables with special compounds may be installed at lower temperatures depending on the compounds and specified conditions in any case the cable must have been stored at the minimum installation temperature or higher for at least 24 hours and the ambient air temperature must not be lower than the minimum installation temperature during installation or damage to the cable sheathing may occur. It is particularly important at low temperatures that the cable sheath is not subjected to mechanical damage / longitudinal twisting and pulling tensions exceeding the recommendations as highlighted in point 15 above.
21. PVC cables can be installed at up to 50 Deg C ambient air however the temperature of the outer sheath should never exceed 50 Deg C during installation so precautions to shade the cable from direct sunlight prior / during and after installation are required. Pulling / installing cables with a sheath temperature above 50 Deg C may result in damage to the outer sheath.
22. LSZH sheathed cables can be installed at up to 45 Deg C ambient air however the temperature of the outer sheath should never exceed 45 Deg C during installation so precautions to shade the cable from direct sunlight prior / during and after installation are required. Pulling / installing cables with a sheath temperature above 50 Deg C may result in damage to the outer sheath. It should be noted that LSZH

cables are primarily designed for installation in confined areas where the generation of toxic gases and smoke generation may impart the evacuation of personnel this is normally the case in internal locations. If LSZH sheathed cables are to be installed in out door applications it must be noted that LSZH is not so mechanically robust as PVC compounds and great care must be taken to avoid excess stress during installation as highlighted in above points 13 ,14, 15 & 16.

23. **In extremely harsh environments such as desert it is recommended that the normal bending radius be doubled.**
24. All cables shall be protected from exposure to direct sunlight by appropriate installation methods. i.e shades over cable ladder or tray.

#### **IMPORTANT NOTICE:-**

**It is imperative that at no time during cable pulling, gland fitting, terminating and the final installed fixed position that the bending radius is less than that appliclable for the cable construction. If in doubt contact your supplier or BTC Iberica directly for specific cables. Exceeding the minimum bending radius may damage the cable components and render any warranty invalid.**

## STORAGE AND DRUM DISPOSAL

22. Cable drums should be regularly inspected during storage to assess their physical condition and the nuts / bolts tightened as per 2.4f
23. Battens, where applied, should not be removed from drums until the cable is about to be installed.
24. When handling drums, reasonable precautions should be taken to avoid injury. Due regard should be paid to the weight, method and direction of rolling, lifting, protruding nails and splinters.
25. Care should be taken with the disposal of empty drums and battens.
26. Small quantities of timber from drums or battens, which may have been treated with wood preservative, may be burnt under carefully controlled conditions in the open.

## GENERAL

27. The by-products of burning scrap cable can be a health hazard. Incineration should only be undertaken by a licensed contractor.

### **NOTE:-**

**It is the responsibility of the purchaser to ensure the cables are handled and installed by competent, experienced personnel utilising the correct equipment and procedures. Failure to follow this guide may cause damage to the cable, danger to those involved with the installation and may render the manufacturers warranty invalid.**

Issue Date 16<sup>th</sup> July 2009

## **B.T.C. IBERICA**

### **THE HANDLING OF DRUMS OF CABLES**

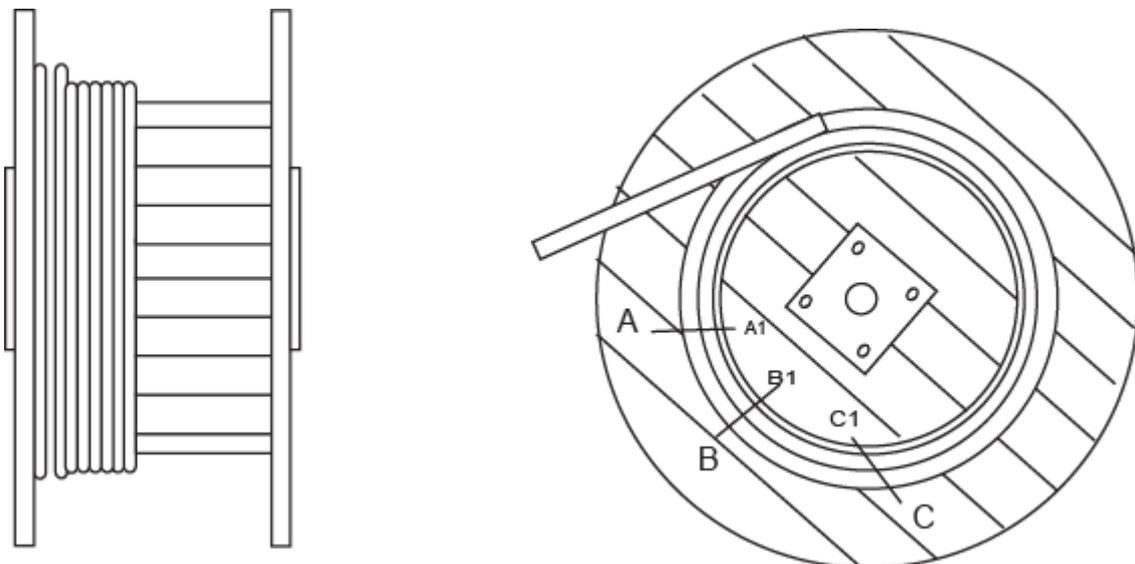
### **CABLE MIGRATION**

This issue will be avoided if an elementary rule had been applied and the end of the cable loosened off and, if necessary, re-secured. Had the cable not “squeezed out forming a loop”, the last few metres would have been severely damaged. If the length of cable on the drum is a long one, it might be necessary to loosen and re-secure the end two or three times during the operation of unwinding.

It has always been recognised that the inside end of the cable has a tendency to creep through the hole in the flange when the drum is revolved in the opposite direction to that originally employed when winding the cable onto it. The tendency for the inner end of the length of cable wound onto a drum to creep through the hole in the flange when the drum is unwound cannot be prevented.

The amount of creep age depends on the length of cable on the drum, the size of the cable, and the number of the times the drum is revolved. The accumulated slack due to unwinding long lengths of cable may amount to the several metres.

The sketch illustrates how the accumulated slack if forced into the sinuous shape on the barrel of the drum, or, up between the layers of cable above it. The resulting damage can be very serious.



Creep age of the cable on a drum occurs in the following manner :

1. The coils of cable, by their own weight and by the weight of successive layers above, are pressed down at the top of the barrel and lie clear underneath it.
2. As the drum revolves, although the underside of the barrel travels to the top, the slackness remains at the bottom effecting a movement of cable around the drum.
3. The points, A, B, C, on the cable and A1, B1, C1, on the barrel will come into successive contact as the drum rotates, and the slackness will travel along the cable in the opposite direction (towards the top).
4. Because one coil will gradually merge into the next as the drum is turned the slack is transferred from coil to coil, in an outward direction, until it eventually runs out at the top or free end, of the cable.
5. If the cable is pulled in the opposite direction to that in “unwinding cable”, the slack will be transferred in an inward direction until it arrives at the secured inner end of the cable and tries to force itself out of the hole in the flange of the drum. The process is cumulative and with long lengths of cable, many metres of slack may collect at the inner end.
6. If the inner end is not released the slack will :
  - (a) Force itself out of the flange hole by forming a loop
  - (b) Be forced into a sinuous shape on the barrel of the drum
  - (c) Be forced between the layers of cable above it

### **DRAWING OFF**

When the drum is mounted on cable jacks, in order to draw off and lay the cable, it is pulled in the direction shown. In this instance, the end passing through the flange must be slackened off and care taken to ensure that it is free in the hole. This will prevent the slack accumulating inside the drum by enabling it to pass out through the hole in the flange. No trouble or damage need then be anticipated.

Fig 1. It is imperative that drums lifted by crane use spreader bar suitable for the weight and dimensions of the cable drums.

Fig 2. Failure to use a spreader bar will exert pressure on the upper section of the drum, the larger & heavier the drum the greater the pressure and potential for possible sever damage.

Fig 3. The result of lifting a cable drum without a spreader bar may lead to the upper section being crushed while the lower section is pulled apart damaging the inner barrel and pulling the staves out of the housing in the flange leading to the possible partial or total collapse of the drum barrel.

Fig 4. The cable will be crushed where the flanges are forced together and left loose where the flanges are pulled apart.

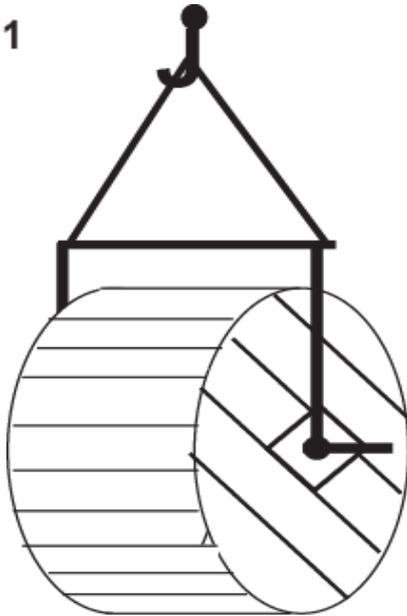
Fig 5. The cable must be pulled in the direction shown keeping an even and constant pressure and speed suitable for the weight & dimensions of the cable drums. It is strongly recommended that for large and heavy drums specifically designed pay off machines are utilised.

Fig 6. Cable must never be uncoiled in this way.

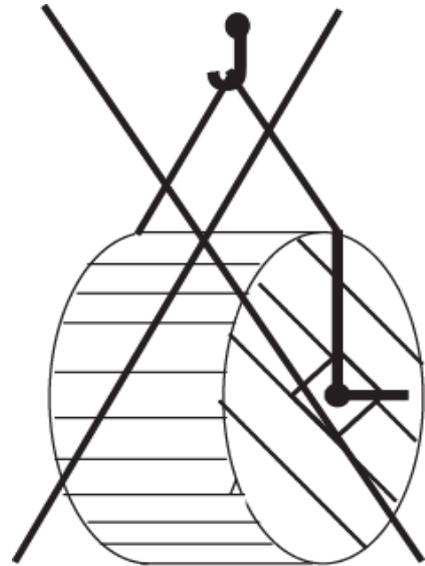
Fig 7. Cable must be pulled in this direction against the way in which it was originally wound onto the drum, pulling in the opposite direction may cause the inner layers to force themselves up and even through the upper layers and can severely damage the cable internally.

Fig 8. Cable can only be re drummed as indicated.

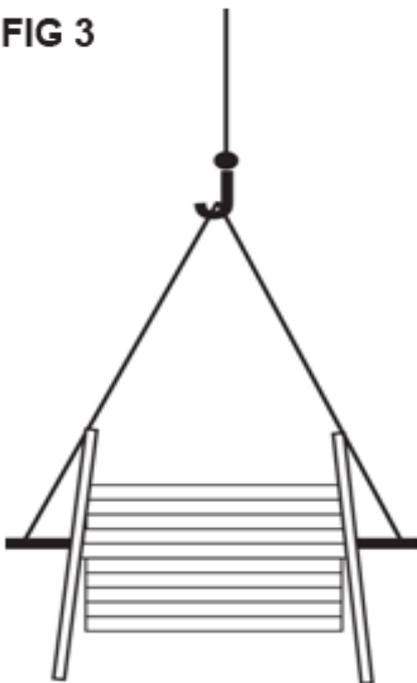
**FIG 1**



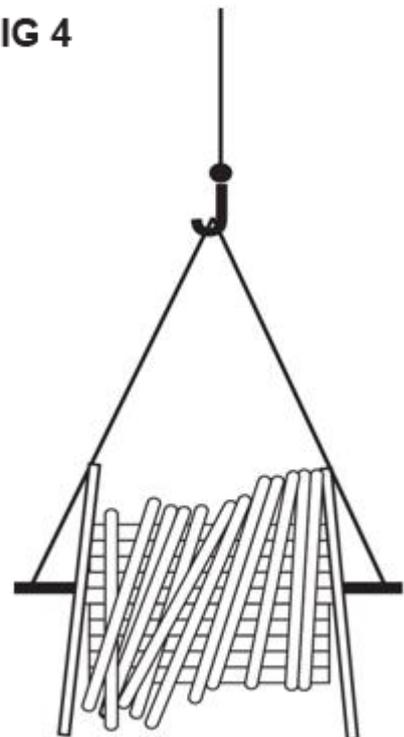
**FIG 2**



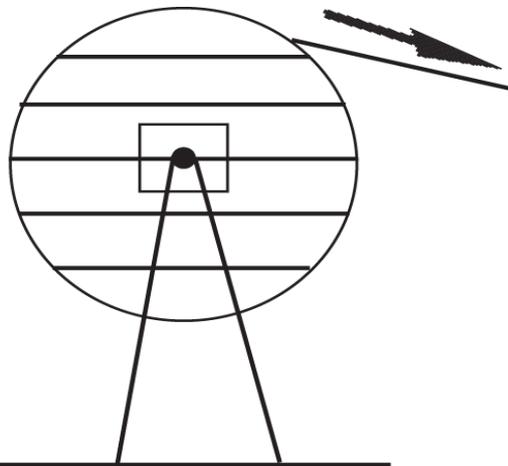
**FIG 3**



**FIG 4**

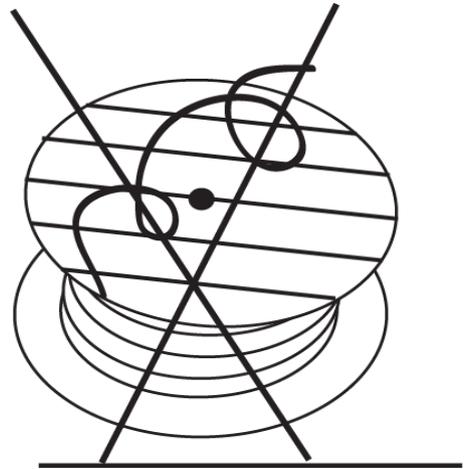


**FIG 5**



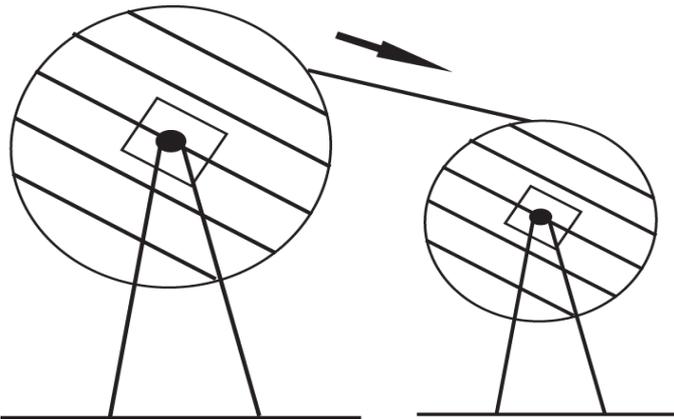
Cables should be unwound as shown

**FIG 6**



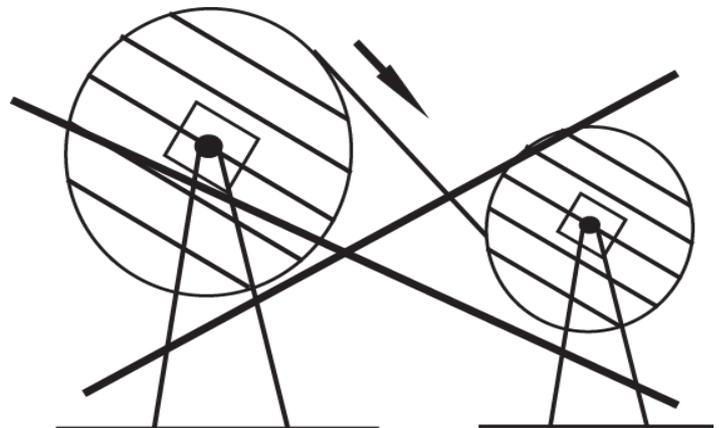
Cable should not be unwound in this way.

**FIG 7**



Cable should be rewound from drum to drum as shown

**FIG 8**



Cable should not be rewound in this way