

دوكاب Ducab

دليل دوكاب للتعامل وتخزين وتركيب البكرات Ducab Drum Handling, Storing and Installation Guide



حلول متقدمة للكابلات من خلال التقنية والابداع
Advanced Cable Solutions Through Technology and Innovation

BICC

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TECHNICAL ADVISORY SERVICE

Specialist advice and assistance on all matters concerning Cables Drum Handling is available from Ducab Sales Offices or direct from Dubai Cable Company (Private) Limited, P. O. Box 11529, Dubai, U. A. E., Tel:(9714) 8082 500, Fax: (9714) 8082 511.
E-mail: ducab@ducab.com Website: www.ducab.com

Ducab is listed in the following publication issued by the Department of Trade and Industry of the United Kingdom.

“THE DTI QA REGISTER - PRODUCTS AND SERVICES LIST”

Only those companies whose quality system is assessed and certified by U.K. accredited certification bodies appear in the above publication.

INTRODUCTION

Ducab - Dubai Cable Company (Pvt.) Ltd., is the leading manufacturer of electric cables in the Middle East. Established in 1979, the company is owned by the Governments of Dubai and Abu Dhabi. Ducab is based in Jebel Ali, but to meet the continuing demand and keep pace with the steady growth of the region, Ducab completed a second factory in Abu Dhabi in 2005. This state of the art facility doubles the production capacity enabling Ducab to better service its customers.

This catalogue provides working instructions on Drum Handling & Installation of cables. Separate catalogues are available for Ducab's range of Low Voltage Control & Auxiliary Cables, PVC Insulated Wiring Cables, XLPE Power Cables, Lead Sheathed Cables, **Ducab Smokemaster** - LSF Wires and Cables, **Ducab Powerplus** Medium Voltage Cables and **Ducab Powerplus** Medium Voltage Cables for Oil, Gas and Petrochemical Industries.

CUSTOMER SERVICE

Dubai Cable Company - Ducab - is the leading cable manufacturer in the Middle East and, since 1979, has been meeting the requirements of customers throughout the Middle and Far East. Ducab's cables are used by some of the most demanding utilities in the world, for the following reasons:

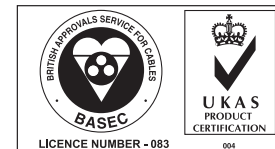
Product Quality

Ducab was presented with the Dubai Quality Award 1994, for the best local industrial company of the year. Ducab was honoured with the Dubai Quality Award '98 Gold Category. In 2004, Ducab won the DQA Gold category for the second time, the only organisation to achieve such distinction. The Gold Award rewards the most distinguished companies which are judged to be world class.



BASEC Certification

Ducab is also proud to hold a Product Marketing Licence issued by BASEC (British Approvals Service for Cables).



Lloyd's Register

Ducab's product range holds the Type Test approval certification from Lloyd's register.



Reliability

Specifying the right cable for a particular application is the first step. The key to reliability however, is in the manufacturing process. The cable must be free from material and manufacturing defects, and weaknesses that will be revealed in service.

Ducab constantly monitors its manufacturing processes and operates stringent quality assurance procedures to give long term reliability. This is of vital significance where cables are to be installed in locations where future access would be difficult and this is where Ducab's reputation and the resources give peace of mind.

Performance

Optimum cable performance can be provided only by a company such as Ducab, with access to the latest developments in conductor, insulation and protective materials technology. In addition, Ducab's knowledge of application requirements throughout the Middle and Far East is an assurance of high performance.

Where required, Ducab can incorporate special features, for example to give the cable low smoke and fume (LSF) or reduced flame propagation characteristics, or to resist damage from chafing or impacts.

Our experienced Technical Staff can provide guidance on cable selection and installation and can ensure that you get the right cable for the job.

Safety

Ducab is able to maintain a close watch on world developments in cable technology and regulations and therefore ensure that its products are designed and constructed to be hazard-free under the prescribed conditions of use.

Ducab uses only tried and tested materials and processes in full compliance with all relevant British and International Standards. Our cables are therefore manufactured for safe use without risk to health on the understanding that users will exercise the same degree of care in their selection and application.

Safety is also an important issue for Ducab, and the strictest standards are adhered to throughout the company. Ducab is proud of its safety record and has been awarded RoSPA (Royal Society for the Prevention of Accidents) Gold Awards for safety from 1991 to 1999. In 2000, Ducab was awarded the prestigious President's Award for Health and Safety which is a recognition of Ducab winning 10 consecutive Gold awards and acknowledges Ducab's total commitment to health and safety. In 2002, Ducab was declared the joint winner of the Manufacturing Industry Sector Award from RoSPA.

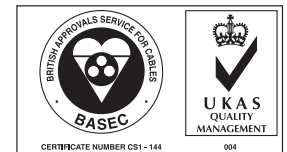


Ducab is the first organisation in the Middle East to receive accreditation to OHSAS 18001 by the BASEC (British Approvals Service for Cables). Certification to OHSAS 18001 provides a recognisable Occupational Health Safety Management standard against which an organisation's management systems can be assessed and certified. Based on the structure of ISO 14001, the standard requires continual improvement in health and safety related activities.

Quality Management System Certified to ISO 9001:2000

Ducab's Quality Management System conforms to the ISO 9001:2000 International Quality System Standard and is certified by the British Standards Institution who are an internationally recognised quality authority accredited in the UK and throughout the world. Ducab also holds ISO 9001:2000 certificate issued independently by BASEC.

Certification to the ISO 9001:2000 International standard demonstrates that Ducab has drawn up written procedures to ensure full compliance with all requirements of the standard and that these procedures are followed by every department in the company, thus ensuring that the goods leaving Ducab's factory are of the highest quality and meet each customer's requirements in every respect.



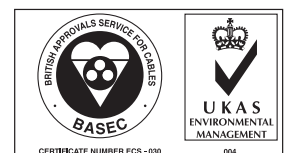
Ducab is particularly proud to have achieved certification to the stringent ISO 9001:2000 standard as it is an independent conformation that it designs, manufactures and tests cables consistently to accepted standards.

ISO 9001:2000 is widely used throughout Europe, and is therefore a reassurance to Ducab's customers that the products and service supplied by the company are equal to the best in the world.

Environmental Management System Certified to ISO 14001

Ducab's Environmental Management System conforms to the ISO 14001 International Environmental Management Standard and is certified by the British Standards Institution who are an internationally recognised certifying authority accredited in the UK and throughout Europe.

Certification to the ISO 14001 International standard shows that Ducab has a well defined structure and established working practices aimed at limiting its impact on the environment. Measurement and monitoring of effects, issuing work instructions, training of personnel and taking corrective actions are all essential elements to limiting the impact on the environment. Ducab has set improvement targets to reduce the significant environmental impacts associated with its activities.



Ducab is proud to be the first cable manufacturer in the region to achieve certification to ISO 14001 and this certification along with its quality, business success and safety record demonstrates that Ducab is a world class organisation and can hold its head up to any business community throughout the world.

Customer Satisfaction

Ducab's customer satisfaction programme, 'Shareek' is designed to ensure that customers receive a consistently high level of service from Ducab's dedicated staff.

GUIDANCE ON HANDLING, STORING AND INSTALLATION OF POWER CABLES

1. HANDLING

Damage to cables can occur due to the incorrect handling to which the drums and cables may be subjected, causing breakdown of the drum flanges and in exceptional cases, movement of the drum barrel takes place. Once this breakdown of the drum occurs, the cable is immediately exposed to damage.

For guidance on handling, please refer to the sketches and notes contained in this booklet, which should be followed closely. We have no objection to the use of fork-lift trucks providing that care is exercised not to damage, or remove, the protective battens when pushing the 'forks' under the drum flanges. Unloading can also be safely accomplished by means of ramps and winches. (See Figures 1 & 2).

Under no circumstances should a drum be rolled off a vehicle on to a 'cushion' of sand, tarpaulin, etc. This action could crumple the flanges and barrel of the drum, driving splinters and/or nails into the cable. (See Fig. 5).

2. STORAGE

If any time the drums of cable are required to be stored for reasonably long periods, e.g. prior to shipment or installation, the following points should be noted.

- 2.1 The site for storage of drums should be well drained, hard packed soil, or preferably a concrete surface, which will not allow the drums to sink and so give rise to damage due to the extreme difficulty in moving drums when they are sunk into the ground.
- 2.2 All drums should be stored with the battens intact, and in such a manner as to leave sufficient space between them for air circulation. Check and tighten tie bolts on the drums at regular intervals.
- 2.3 Tier stacking of drums is not recommended. In no circumstances must the drums be stored 'on the flat', i.e., with flanges horizontal. (See Figure 3).
- 2.4 All drums, during installation (i.e. when the battens have been removed), should be 'scotched' so that there is no danger of the flanges of drums coming into accidental contact with unprotected cable on other drums. The cables should not be left unprotected. (See Figure 3).
- 2.5 Cables should be protected from direct rays of the sun by leaving the battens on or covering the cables with thick black polythene sheet.

IMPORTANT: Cable ends must be sealed with end caps during storage and transportation.

3. INSTALLATION

3.1 Minimum Temperature during installation

To avoid risk of damage during handling, the cable should be installed only when both the cable and ambient temperature are above 0°C and precautions have been taken to maintain the cable above this temperature. However, the cables are suitable for operating at temperatures between below 0°C and the specified maximum limit, provided that they are not bent or struck when at temperatures below 0°C.

3.2 Laying

Normally cables are supplied on wooden or steel drums and great care should be taken during running off to ensure that the cable does not kink. The drum position should be chosen so that the longest length of straight trench is at the pulling end, with any severe bends as close as possible to the drum.

It is important that the rolling of the drum to this position should be in accordance with the arrow on the flange – to prevent loose turns from developing during unwinding. The distance of rolling should be kept to a minimum.

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Drums should be mounted so that the cable is pulled from the top of the drum, and for very heavy cable, it may be necessary to use a ramp to support the cable during the passage into the trench. As the cable is run off, the drum will rotate in the opposite direction to the arrow on the “ROLL THIS WAY” marking.

The excavated trench should be carefully examined to ensure that there are no sharp edged stones, foundations, reinforcing metalwork, etc. which could damage the cable, and riddled earth or sand should be used as a bedding.

Preparation of the trench, prior to installing the cable, comprises the installation of skid plates, rollers, etc. and paying out the winch rope, if using power assistance. Cable rollers are necessary to prevent the cable from touching the ground, and should be spaced a maximum of 2m apart for normal size cables. Correct positioning of rollers is important to keep friction to a minimum.

The cable should preferably be drawn to its final position in a continuous manner. During stops, the cable will settle between rollers and may cause high strain on men and machines during restarting. Whether the pulling is manual or with a winch, it is necessary for one man to be stationed at the drum with a plank of wood wedged against the flange of the drum so that over-running of the drum is prevented if the pulling stops. Otherwise, many loose turns can easily develop on the drum.

When pulling by a winch it is advantageous for the cable end to be taken by hand as far as possible before attaching the winch rope. This allows the leading cable rollers, skid plates, etc to take the load and settle under well-controlled conditions. The winch operator must, at all times, carefully observe the dynamometer to prevent overloading. On long pulls, good communication is essential, preferably by radio.

When pulling a power winch, more attention has to be given to the maximum pulling load which is permissible. For such installations a pulling eye attached to the conductors is necessary, and for copper conductors a pulling tension of 6 kg force per sq.mm of total conductor area can be applied (with the proviso of 2000 kg force maximum).

Graphite paste should be used for lubrication when cables are being pulled into ducts.

For open trench and straight installations, a cable ‘stocking’ can be used. It is advisable, however, to protect the oversheath with a layer of bitumen tape applied with 50% overlap.

Cables should never be bent to a small radius. As large a radius as space permits should be adopted. Under no circumstances should the bending radius be less than the minimum permissible limits. It is particularly important to have a generous bending radius when cables are to be pulled by a power winch, so as to keep within the maximum permissible pulling tension and to prevent the cable being flattened around bends or in ducts.

3.3 Installation Parameters

A. Minimum Bending Radius for LV Cables

Type of Cable	Minimum internal radius of bend
Single core Unarmoured Cables	6 D
Single core Armoured Cables	6 D
Multicore Armoured Cables with Sector Shaped Conductor	8 D
Multicore Unarmoured Cables with Sector Shaped Conductor	8 D
Multicore Armoured Cables with Circular Conductor	6 D
Multicore Unarmoured Cables with Circular Conductor	6 D
Lead Sheathed Cables	12 D

D is the tabulated overall diameter of cable

B. Minimum Bending Radius for MV Cables

Type of Cable	Installation and Bending Test (without former)	Joints and Terminations (with former)
Single Core Unarmoured	20 D	15 D
Single Core Armoured	15 D	12 D
Three Core Unarmoured	15 D	12 D
Three Core Armoured	12 D	10 D

For Lead Sheathed Cables, instead of D, consider (d+D) where
d = Conductor Diameter, and D = Overall Diameter

C. Internal Diameter of Duct

Cable Diameter (mm)	Internal Diameter of Duct (mm)
Up to 65	100
65 - 90	125
90 - 150	200

D. Maximum Pulling Tension

For Copper Conductor Cables = 6 kgf x number of cores x conductor cross-section
= 60 N x number of cores x conductor cross-section

For Aluminium Conductor Cables = 3 kgf x number of cores x conductor cross-section
= 30 N x number of cores x conductor cross-section

(Subject to a maximum of 2000kgf or 20,000 N)

E. Side Wall Pressure

$$= \frac{\text{Maximum Pulling Tension (kgf)} \times 100}{\text{Minimum Bending Radius (mm)}}$$

(Subject to a maximum of 500kgf or 5,000 N/m)

3.4 Final placing of cable

Before disconnecting the pulling rope, the cable is laid off, i.e. starting at one end, it is carefully lifted from the rollers and deposited on the bottom of the trench. About 10m of cable should be lifted at one time, any slack being carried forward. The end position of a cable run may require double handling because it is not possible to draw cables straight into buildings. In this case the cable is overpulled, then man-handled into the required position. At all times the loops should be kept as large as possible so that the bending radius is always above the minimum permitted.

Similarly, at the drum locations the necessary length of cable may be unwound from the drum and laid out, in a figure of '8' if space is limited, prior to cutting to length and placing into position. Immediately after cutting, the cable ends must be suitably sealed to prevent ingress of moisture. In this respect it is also important to carefully examine the pulling end seal to ensure that it has not been damaged during laying. (See Figs. 14 & 15).

3.5 Backfilling and Reinstatement

Prior to backfilling, it is necessary to carry out a visual inspection, and items which need to be checked are:

- 3.5.1 The cables have a suitable bedding, such as sieved sand or soil. Stone chips and other sharp objects in the cable route should be removed.
- 3.5.2 The spacing is correct if there is more than one cable in the trench.
- 3.5.3 Pulling equipment is carefully removed.
- 3.5.4 The cable is free from obvious damage caused during installation. A very high proportion of cable failures in service are due to such damage. It may be necessary to inspect the underside with a mirror. In such cases it is advisable to make a first inspection whilst the cable is still on rollers.
- 3.5.5 It is very important that any damage to the oversheath should be repaired before backfilling is commenced. Strict attention to detail is necessary in making such repairs and only the approved materials specified should be used. Depending upon circumstances, heat shrinkable sleeves, may be used.

3.6 Backfilling

The cable should firstly be surrounded and covered with appropriate bedding material, using sand or riddled soil as necessary, to give a compacted cover over the cable. As required, cover tiles or plastic marking tape may then be placed centrally over the cable.

The first layer of backfill should be done manually and compacted by hand panning until a thickness of approximately 150mm over the tile is reached. Subsequent material may be placed and compacted with mechanical equipment.

ELECTRIC CABLE DRUM HANDLING

A. ROLLING DRUMS

Drums of cable must always be rolled in the direction shown by the arrow painted on the flanges, but such rolling should in any case be kept to a minimum.

B. TURNING DRUMS

The best way to turn a cable drum is to roll it on to two well-greased thin plates or boards about 2 feet square. The plates can then be used as a turntable and the drum rotated to the desired direction. The practice of using an iron bar under the bolt head is regarded as extremely dangerous to the operator and is detrimental to the drum.

C. LOWERING OR LIFTING DRUMS

When drums are moved from one level to another, e.g. lorry to ground, wharf to ship, etc., lifting and lowering gear must always be used. When drums are lifted from the upper layer of a tiered stack, care must be taken to ensure that no movement of the bottom layer occurs so as to cause collapse. Drums, whether loaded or empty, and too heavy to be man-handled, should always be slung; they should never be dropped. (See Figures 1 & 2)

When lifting drums of cable for loading or unloading, spindles must always be used in conjunction with crane slings, chain “brothers” or lifting beams. On no account must any drum be lifted by other means, i.e., by using claw-grabs, wire slings, etc. (See Figure 1)

When lifting drums of cable weighing more than 2 tons, lifting beams or stretchers between the sling or chain brothers must be used to prevent the flanges crushing on to the cable as illustrated. (See Figure 1).

Note: Normally the hooks or slings should be close to the drum flanges.

CABLE HANDLING AND INSTALLATION INSTRUCTIONS

A. COMPLIANCE WITH REGULATIONS

The use of cables must comply with Environment and Safety regulations of the country where it is being used. Necessary guidance may be obtained from the IEE Wiring Regulations of the UK.

B. INSTALLATION LOCATIONS

The cables can be used indoors or outdoors, but certain reservations are necessary concerning cables for direct burial in the ground. For example, it is not recommended that the cables be installed in sustained wet conditions or other aggressive environments. Unprotected open cable ends should not be exposed to moisture prior to final termination or jointing.

The cables shall not be subjected to the deleterious effects of chemical substances on installation or subsequently, for example, the cables should not be installed where there is a risk of sustained contamination due to hydrocarbon or chemical spillage.

Where cables are installed in environments in which ultraviolet radiation may occur, account should be taken of any effect this may have on the material of the cable sheath. It is recommended that the cables be shielded from direct sunlight.

C. SPECIAL PRECAUTIONS

For overall cable sheaths containing an anti-terminate masterbatch, the following health warnings are relevant:

Health Warning

Safety precautions must be strictly adhered to when handling cables treated with insect repellent additives. Appropriate warning labels should be attached to the cables which state:

'The serving or oversheath of this cable contains insect repellent. Wear gloves when handling and wash hands thereafter before eating, drinking or smoking'.

'Gloves must be worn when handling this cable'.

D. MINIMUM INSTALLATION RADIUS

None of the cables should be bend during installation with a minimum internal radius of bend less than that recommended for the cable type by the manufacturer.

E. CABLE SUPPORT SPACING

Refer to cable product catalogues regarding recommended spacings for cable supports.

F. PACKING AND HANDLING

It will be obvious that in certain circumstances the packaging of cables, e.g., large heavy drums or sharp edges of metal components of cables could constitute a safety hazard and individuals should therefore take due care for their own safety when handling these items. The springing of the steel binding straps or the dangers arising from projecting nails used to retain battens around the drums or containers are particular examples to which we draw your attention.

REPAIRS TO PVC OVERSHEATHS

During cable drum unpacking, rewinding or laying, damage to the oversheath may accidentally occur. If the cable underneath appears to be in good condition, repair to localised damage at site may be carried out as suggested in the following alternative methods. The objective is that there is no possibility of moisture ingress through damage to the armour or other parts of the cable when it is in its final installed position.

It is very important that any damage to the oversheath observed after installation should be repaired before backfilling is commenced. Strict attention to detail is necessary in making such repairs and only the approved materials specified should be used. Only a brief outline for PVC sheath repair is given below and in case of doubt, the cable manufacturer's advice should be sought. Some of the methods quoted are only suitable for use after installation has been completed, when the cable will not be subjected to significant movement in service.

a) Superficial damage

The local area of damage is rubbed down with carborundum strip to the depth of the damage and chamfers of 25mm length are formed at the edges. After cleaning with a suitable solvent*, PVC self-adhesive tape of 25mm width is applied under tension with 50% overlap. The taping is continued up the chamfer until the top is reached. Then another four layers are applied over a length extending 75mm beyond the chamfer.

b) Holes or slits in PVC oversheaths

The edges of the hole or slit are chamfered for a distance of 30mm and the area around this is abraded over a length of 20mm. The area is then cleaned with a suitable solvent* and, if bitumen is present under the oversheath, care must be taken to remove it from the prepared surface. A patch is then applied to fill the area using an approved grade of special putty e.g., BICASEAL. This is followed by an overlapped layer of 50mm wide PIB self-amalgamating tape extending 50mm from the patch and three overlapped layers of PVC self-adhesive tape extending 100mm from the edge of the PIB tape. In the case of slits, further strengthening by the addition of an epoxy resin bandage should be made if the cable is likely to be moved.

c) Removal of a complete ring of oversheath

After removal of the damaged ring a chamfer is formed. The surface is then thoroughly cleaned with solvent*, taking care to remove the graphite layer, if present. Four overlapped layers of 50mm wide PIB self-amalgamating tape are then applied at high tension over a length extending to 50mm beyond the original cut. PVC self-adhesive tape is then applied at one-third overlap to build up to a level corresponding to the original oversheath diameter; the length should be up to the end of the chamfer.

Five layers of PVC self-adhesive tape are then applied, each one extending 5mm further along the cable. The repair is completed with a resin poultice reinforcement consisting of six layers of ribbon gauze or bandage impregnated and painted with an approved grade of freshly mixed epoxy resin. This requires about 12 hours to cure.

d) Repairs with HEAT-SHRINK Sleeves

Heat Shrink sleeves can be conveniently used to repair the damaged oversheath of cables. Where possible, a full unshrunk sleeve is slipped along the cable up to the point of sheath damage but if the cable ends are inaccessible, a zipped sleeve is used.

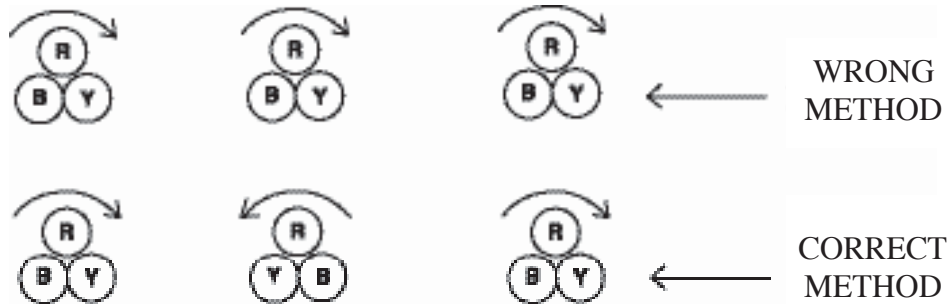
Depending upon the nature of damage the location is prepared and cleaned as above and a special putty such as BICASEAL is applied to cover the opening of the sheath. The heat-shrinkable sleeve is then centrally placed over the point of damage and uniformly heated all round with a gas flame or hot air as recommended by the sleeve supplier. It is important to apply heat evenly and adequately to ensure a water-tight grip.

For repair of special sheath such as LSF contact Ducab Technical Service

* Genklene (ICI) is suitable for these applications.

ELECTRICAL CHARACTERISTICS OF SINGLE CORE CABLES

1. SINGLE CORE CABLES IN PARALLEL

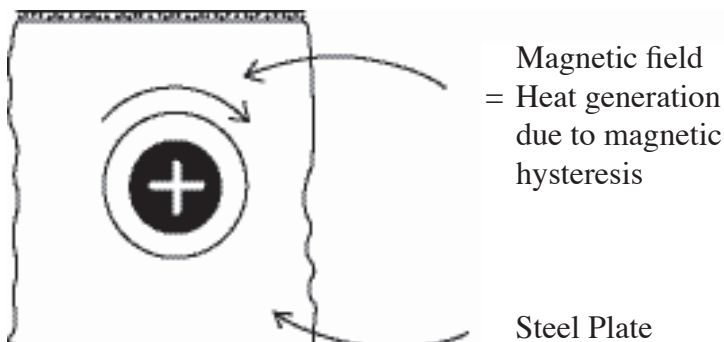


Note: Precise load sharing is difficult with three conductors per phase, and the configuration shown represents the most practical compromise.

2. ARMOURED SINGLE CORE CABLES

- If bonded at both ends, the armour carries a circulating current.
- An insulated adaptor (Ducab Connect part design no.481-AA) used with the cable gland negates the armour circulating current.
- If not bonded at both ends, the unearthed end of the armour has an induced voltage.
- In AC systems, single core cables must have non-ferrous armour.

3. HEATING EFFECT ON SINGLE CORE (AC) CABLE WHEN SURROUNDED BY STEEL



- Use - non-ferrous material
e.g., aluminium or other permissible non-metallic sheet
- Do not pass single core cable through steel conduit.

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LIFTING CABLE DRUMS USING CRANE

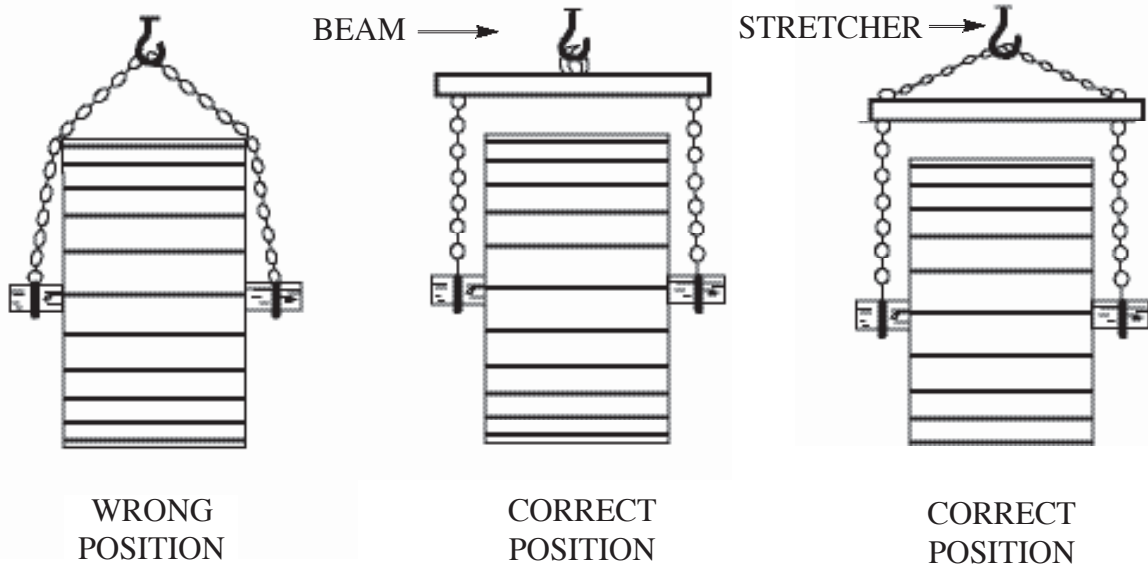


Fig. 1

LIFT DRUMS ON FORK TRUCKS CORRECTLY

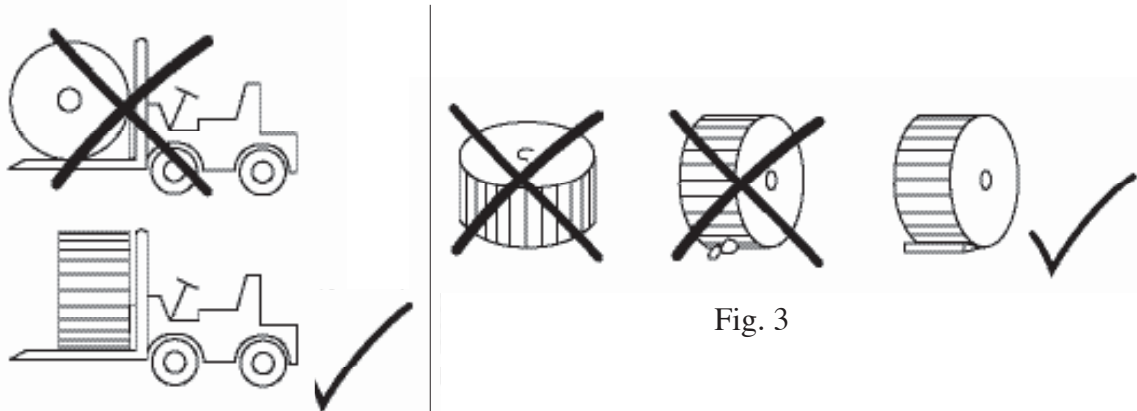


Fig. 2

Fig. 3

- I) DO NOT LAY DRUMS FLAT ON THEIR SIDES
- II) USE PROPER STOPS TO PREVENT DRUMS ROLLING

AVOID DRIVING NAILS INTO CABLE DRUMS

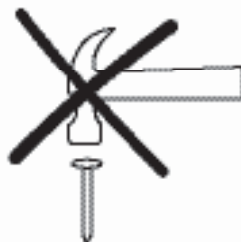
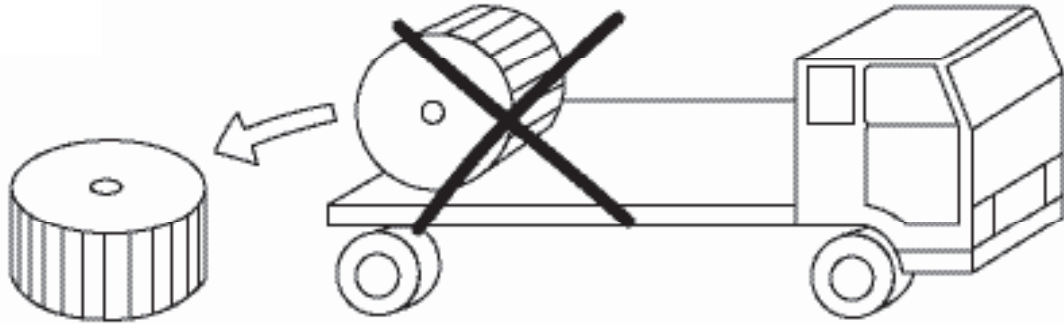


Fig. 4

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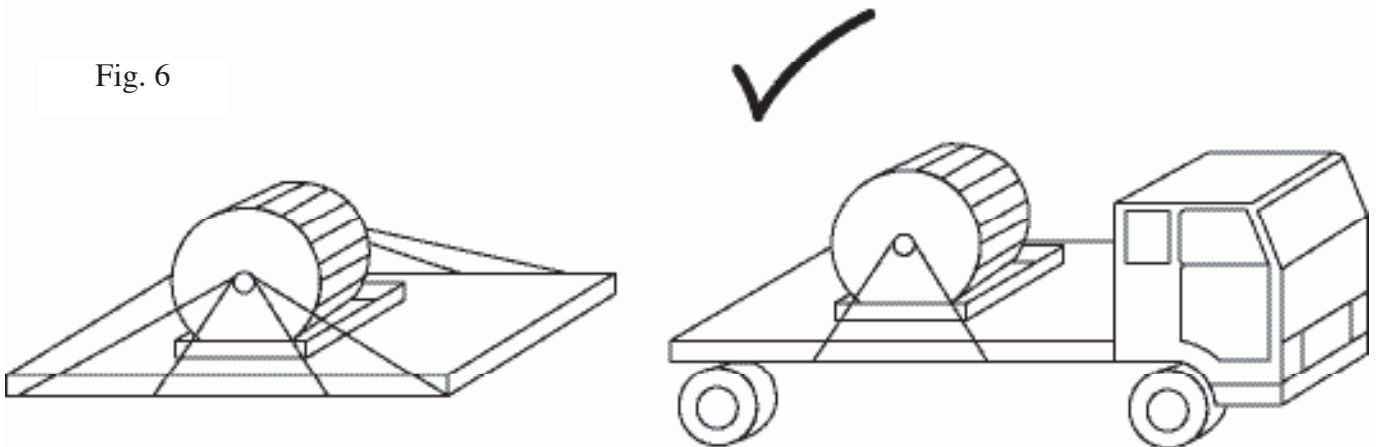
DO NOT DROP CABLE DRUMS FROM TRUCKS

Fig. 5



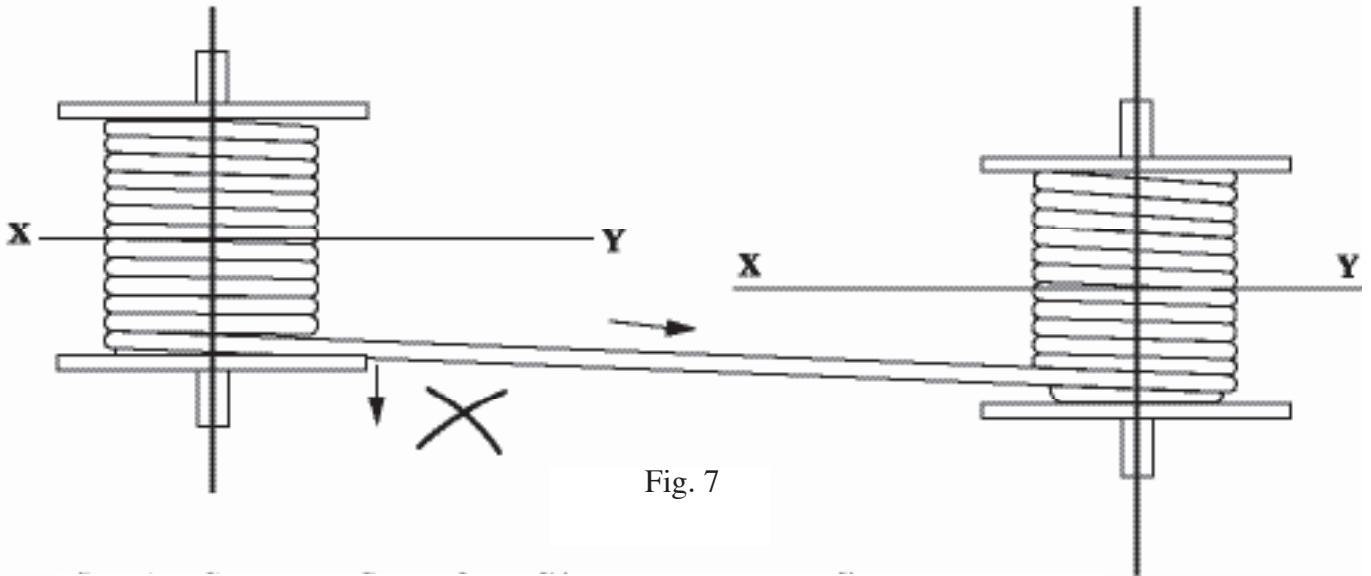
SECURE DRUMS ADEQUATELY BEFORE TRANSPORTATION

Fig. 6

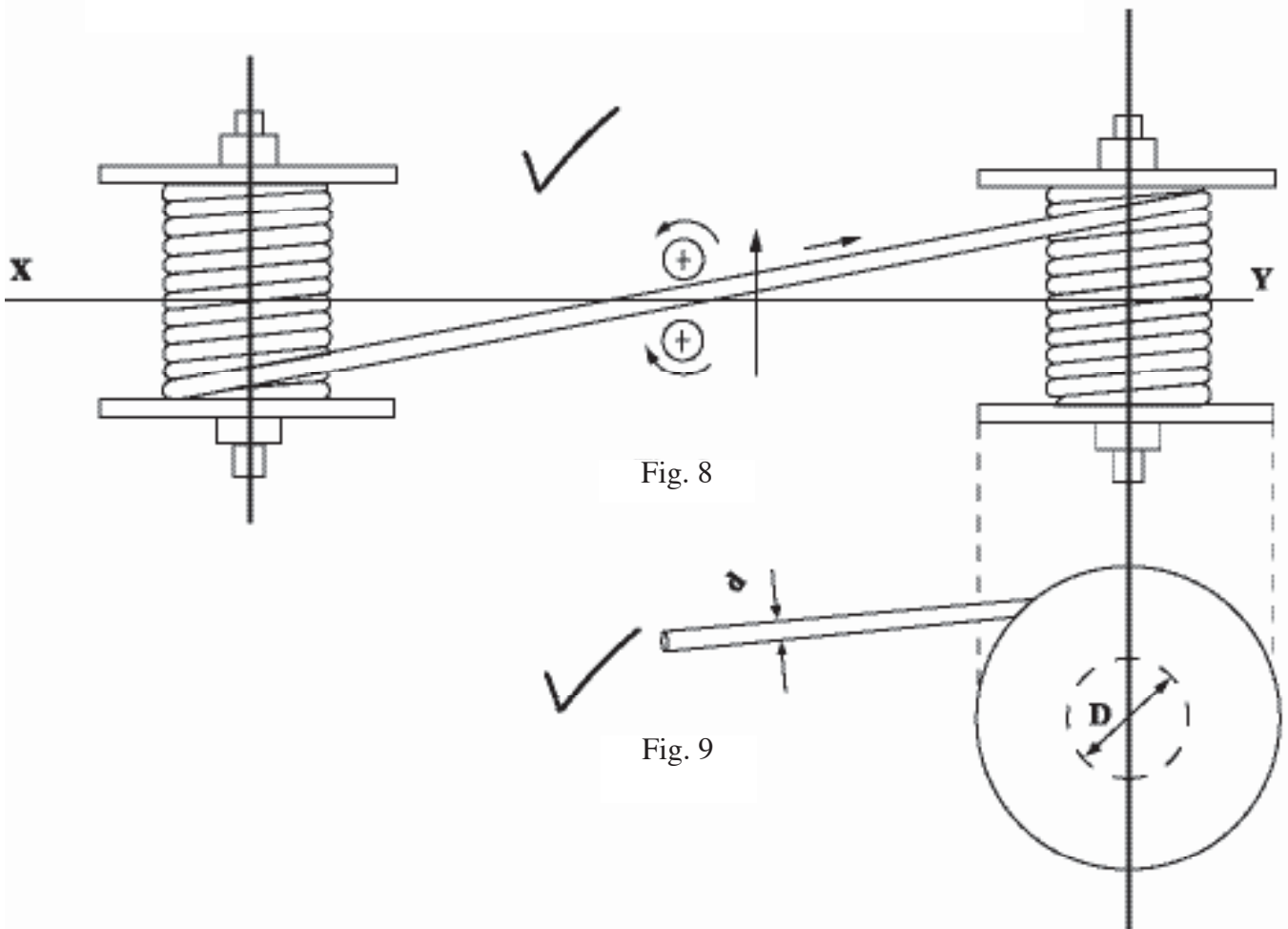


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**DO NOT DRAG CABLES AGAINST
DRUM FLANGES**



- I) ALIGN DRUMS BEFORE CABLE REWINDING
- II) USE STOPPERS TO PREVENT DRUM LATERAL MOVEMENT
- III) USE FREE ROTATING ROLLER GUIDES

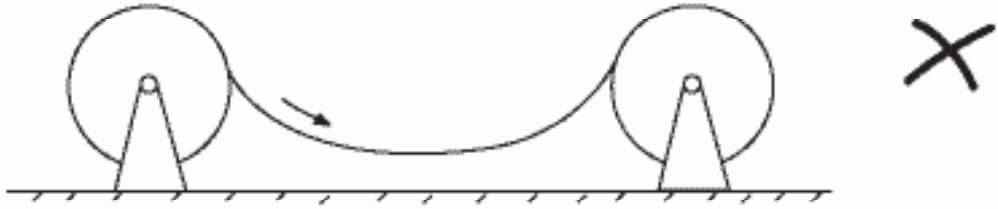


USE DRUMS WITH SUFFICIENT BARREL DIAMETER

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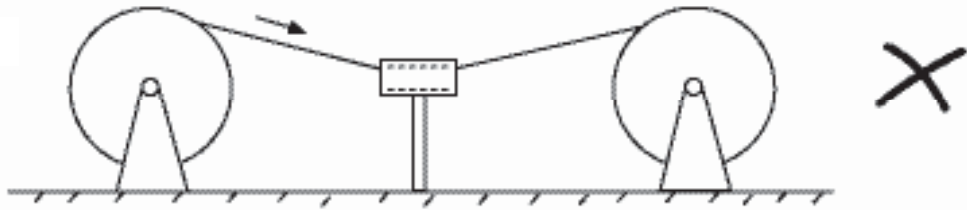
DO NOT PULL CABLE ACROSS LONG UNSUPPORTED SPANS

Fig. 10



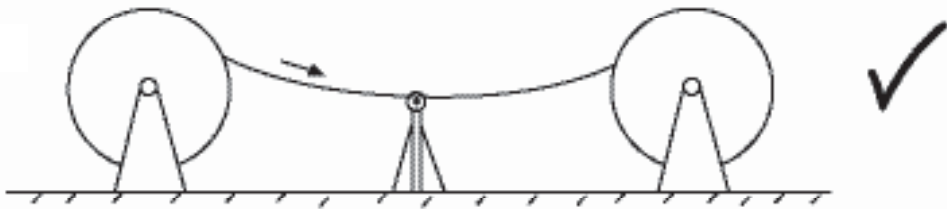
DO NOT DRAG CABLE AGAINST SHARP EDGES

Fig. 11



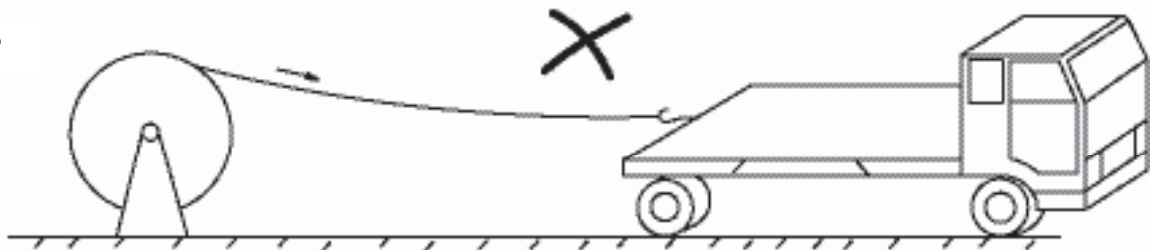
PROVIDE FREELY ROTATING ROLLER SUPPORTS

Fig. 12



DO NOT PULL CABLES WITH POWERED VEHICLES

Fig. 13



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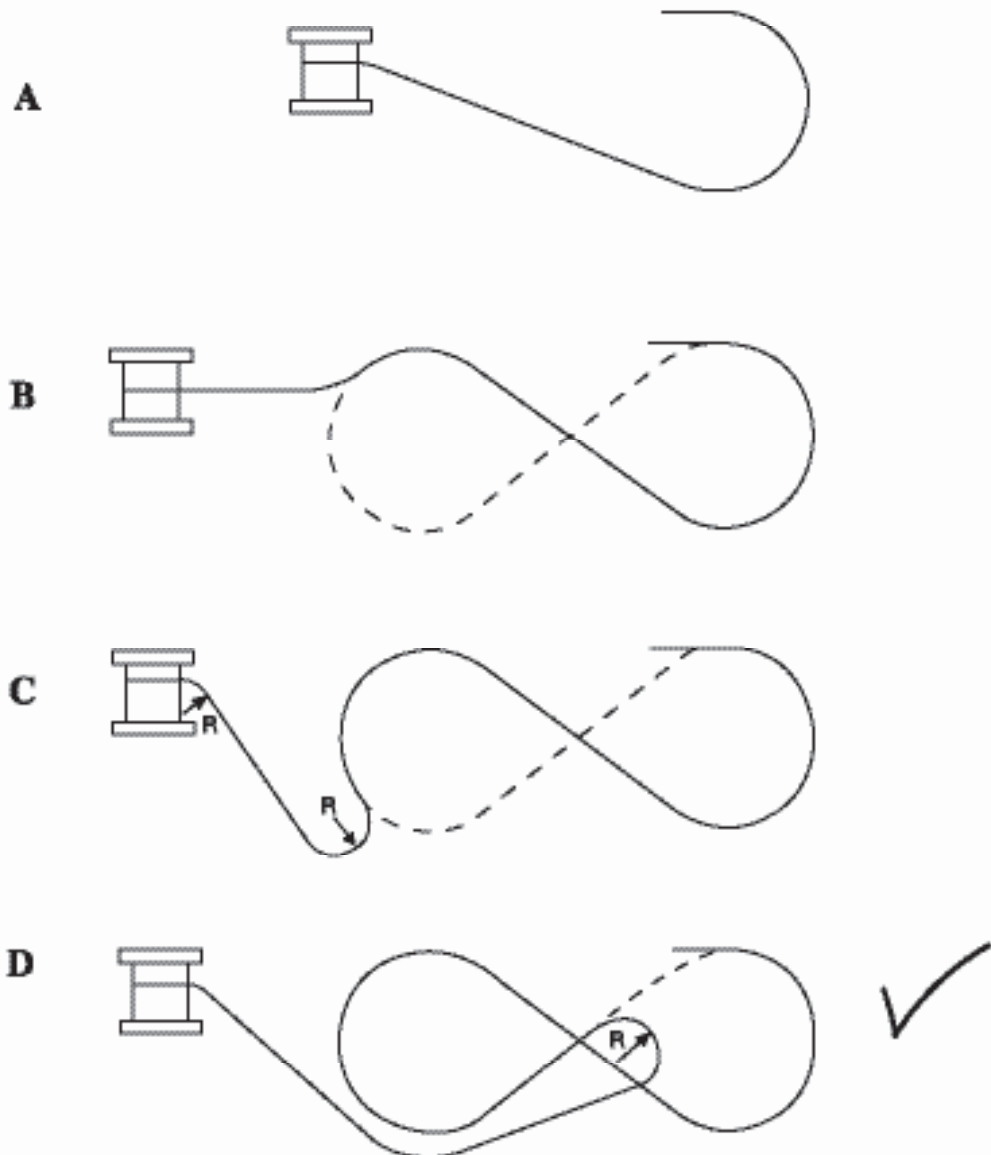
DO NOT ATTEMPT "COILING" OF CABLE ON THE GROUND

Fig. 14



ON THE GROUND CABLE CAN BE FLAKED IN A FIGURE OF EIGHT FORMATION

Fig. 15



Note: R Minimum permissible bending radius of cable.

SPECIAL PRECAUTIONS FOR HANDLING/INSTALLATION LSF (LOW SMOKE & FUME) SHEATHED CABLES

CABLE SHEATH APPLICATION

Material	Key Properties	Recommended for
PE	High mechanical strength	Direct burial / DuctInstallations
PVC	Flexibility & Flame retardance	General purpose . Laying in trench
LSF	Zero halogen / Low Smoke	Mass Transit Systems, High rise buildings & confined locations

Cables like LSF sheath need to be handled with care during installation. While special additives are used in the formulation of LSF compound to give the typical flame retardant characteristics of Zero halogen polymers (e.g high oxygen index, very low smoke density, no acid gas liberation and retardance to flame propagation) some mechanical properties deteriorate. The following basic installation methods are particularly applicable.

- a) Cables should not be exposed to sunlight for considerable period before installation i.e., the temp. of the cable sheath should be below 40 degree Celsius.
- b) Preferably the installation is done during morning hours when the ambient temp is low
- c) Wire/Rope should not be used directly on cable sheath for pulling.
- d) When pulled on cable trays/or any uneven surface, special attention is needed to avoid weldings/or unusually rough terrains.
- e) Rollers and bends should not have any sharpness which may damage sheath.
- f) Special LSF compatible accessories and fixings are recommended for installations requiring enhanced fire performance.

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