

Kanaflex **LEX**[®]

MANUAL

**Duct for protecting
underground energy
or telecom cables**



Kanaflex[®]

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“THANK YOU FOR CHOOSING KANAFLEX PRODUCTS”

1. INTRODUCTION

KANALEX is a High Density Polyethylene (HDPE), black, circular, corrugated and waterproofed duct, with an excellent radius of curvature for protecting underground energy or telecom cables. They are widely used in industry, railway, highway, airport, mall and etc. infrastructure. The KANALEX duct meets various norms recognized in the country, such as: ABNT, Light, Copel, Telefônica, Oi, CPFL, Eletropaulo, Celg and other Energy and Telecom concessionaires.

It has the following characteristics:

- High mechanical resistance (diametral compression and impact);
- Excellent radius of curvature;
- Simple manipulation;
- Lightness;
- Faster installation.

It is supplied in rolls, tied by layers, in order to facilitate handling and laying in the ditch.

2. ADVANTAGES

Below we describe the main advantages of KANALEX ducts:

- a) Polyethylene's high resistance to abrasion on both the external and internal faces reduces damage caused by the installation.
- b) Its corrugated structure and narrow pitches result in greater mechanical resistance.
- c) Fully does away with concrete casing along the line.
- d) Given the very low attrition coefficient between the duct and cable, it is possible to increase distances between the junction or inspection boxes, markedly reducing labor costs and execution time (Figure 1, Table 1).

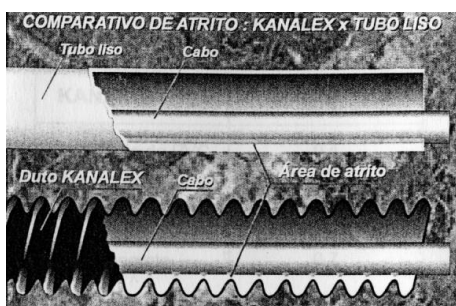


Figura 1
 Comparison of Attrition: KANALEX vs. Smooth Tube
 Smooth tube Cable
 KANALEX Duct Cable Attrition Area
 Figure 1

Table 1 – Comparison of Attrition Coefficient

Type of Duct	Attrition Coefficient
KANALEX Duct	0.3
PVC Tube	0.4
Steel Tube	0.5

- e) Compared with other ducts for the same application, it has a lower unit weight, resulting in easy transportation, handling and installation (Table 2).

Table 2 – Weight comparison between KANALEX and other ducts with the same diameter

Type of Duct	Weight (%)
KANALEX	100
Class A PVC Tube	156
Threadable PVC Electrical Duct	360
Galvanized Steel	1065

- f) Kanalex’s radius of curvature is equal to 8 times the external diameter of the respective duct. In order to avoid any jamming of the cable inside the duct, adopt the worst installation condition, that is, the greatest radius of curvature for the duct or cable to be installed.
Curves and counter-curves near each other along the line are not advisable in either the vertical or horizontal position.
- g) Given its excellent radius of curvature, it does away with most boxes at curves and uneven sites, offering an escape from already existing constructions and natural obstacles, thus facilitating job execution.
- h) PVC coated galvanized steel guide wire, already supplied in the duct, for facilitating cable pulling operations.
- i) It comes with “DANGER” warning tape for Energy or Telecommunications (Optional).
- j) It comes with a complete line of accessories, guaranteeing a quick, perfect and safe job.
- k) Facilitates thermal dissipation due to low resistivity.
- l) It has high dielectric rigidity.
- m) It is supplied plugged on both ends.

n) It has excellent resistance to chemical products (Table 3).

Table 3 – Resistance to chemical products

PRODUCT	Temperature		PRODUCT	Temperature	
	20°C	60°C		20°C	60°C
LEAD ACETATE	E	E	SODIUM CHLORIDE	E	E
ACETONE 100%	E	E,D	ZINC CHLORIDE	E	E
GLACIAL ACETIC ACID	E	G,D,c,f	CHLORINE (GAS AND LIQUID)	F	N
HYDROCYANIC ACID	E	E	CHLORO BENZENE	G	F,D,d,c
HYDROBROMIC ACID	E	E	CHLOROFORM	G	F,D,d,c
CARBONIC ACID	E	E	DETERGENTS	E	E,c
CARBOXYLIC ACID	E	E	DICHLORO BENZENE	F	F
HYDROCHLORIC ACID	E	E,d	DIOCTYL PHTHALATE	E	G,c
CHLOROSULFONIC ACID	F	N	LIQUID SULFUR DIOXIDE	F	N
CHROMIC ACID 80%	E	F,D	SULFUR	E	E
HYDROFLUORIC ACID 1-75%	E	E	ESSENCE OF TURPENTINE	G	G
PHOSPHORIC ACID 30-90%	E	G,D	ALIPHATIC ESTERS	E	G
GLYCOLIC ACID 55-70%	E	E	ETHER	G	F
NITRIC ACID 50%	G,D	F,D,f	PETROLEUM ETHER	G,d,i	F,d
NITRIC ACID 95%	N,F,f	N,c	FLUORIDE	G	N
PERCHLORIC ACID 70%	E	F,D	GASOLINE	E	G,c
SALICYLIC ACID	E	E	AMMONIA HYDROXIDE 30%	E	E
SULFOCHROMIC ACID 80%	F	F,f	POTASSIUM HYDROXIDE CONC.	E	E,c
SULFURIC ACID 50%	E	E	SODIUM HYDROXIDE CONC.	E	E,c
SULFURIC ACID 98%	G,D	F,D,f	SAT. CALCIUM HYPOCHLORITE	E	E
SULFUROUS ACID 50%	E	E	SODIUM HYPOCHLORITE 15%	E	E,D,d
TARTARIC ACID	E	E	ISOOCTANE	G	G
TRICHLOROACETIC ACID 50%	E	E	METHYL ETHYL KETONE	E	F
TRICHLOROACETIC ACID 100%	E	F	NAPHTHA	E	G
ACRYLONITRILE	E	E	SATURATED AMMONIA NITRATE	E	E
SEA WATER	E	E	SILVER NITRATE	E	E
BENZYL ALCOHOL	E	E	SODIUM NITRATE	E	E
BUTYL ALCOHOL	E	E	NITROBENZENE	F	N,c
ETHYL ALCOHOL 96%	E	E	FUEL OIL	E	G
METHYL ALCOHOL	E	E	DIESEL	E	G
AMMONIA	E,D,d	E,D,d	PHOSPHOROUS PENTOXIDE	E	E
ACETIC ANHYDROUS ALCOHOL	E	G,D	POTASSIUM PERMANGANATE	D,E	E
ANILINE	E	G	HYDROGEN PEROXIDE 30%	E	E,d
BENZENE	G,d	G,d,i	OIL	E	G
SODIUM BENZOATE	E	E	KEROSENE	G	G,c
POTASSIUM DICHROMATE 40%	E	E,D	NICKEL SALTS	E	E
SODIUM BORATE	E	E	METAL SULFATES	E	E
WHITENERS	E	G,c	SODIUM SULFATE	E	G
LIQUID BROMINE	F	N	CARBON TETRACHLORIDE	G,d,i	F,d,c
SODIUM CARBONATE	E	E	TRICHLOROETHYLENE	F,D	N,D
AMMONIA CHLORIDE	E	E	XYLENE (XYLOL)	G,d,i	F,d,c

CAPTION

- D – Discoloration.
- E – Exposure for 30 days, without loss of characteristics, able to tolerate contact for many years.
- F – Some signs of attack after 7 days in contact with the product.
- G – Slight absorption after 30 days of exposure, without compromising mechanical properties.
- N - Not recommended. Detected signs of attack within minutes to hours, after beginning of exposure.
- c – Shearing.
- d – Deformation.
- f – Fragilization.
- i – Swelling.

INSTALLATION MODEL – KANALEX SYSTEM

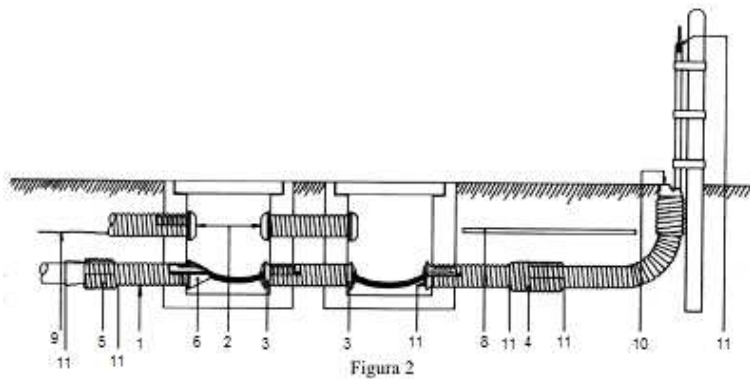


Figure 2

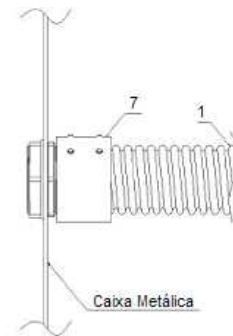


Figure 3
Metal Box

Table 4 – Products and their purposes

PRODUCT		PURPOSE
1	KANALEX	Duct for running and protecting wires and cables
2	Plug	Plug ducts: transport, install and reserve
3	Terminal	Finishing the duct at the box wall
4	Connection I	Join KANALEX with KANALEX
5	Connection II CP	Join KANALEX with smooth ducts
6	Cone	Finishing in the box wall and/or pole
7	CM connection for metal box	Fixation in metal box
8	Danger warning tape	Protection against future digging
9	Guide wire	Primary pulling of the cord or steel cable
10	Lateral climb	Receive ducts for climbing the pole
11	Sealing or mastic tape	Sealing against liquids

Table 5 – Summary of accessories for KANALEX ducts

PRODUCT	PURPOSE
Plug	Plug ducts: transport, install and reserve
Terminal	Finishing of duct in the box wall and protection of cable cover during pulling
Connection I	Join KANALEX duct with KANALEX
Connection II CP	Join KANALEX duct with smooth ducts (PVC, galvanized and others)
Lateral climb	Receives the smooth ducts climbing the pole, after sectioning
Cone	Finishing of the duct in the box wall and/or pole
CM connection for metal box	Fixation of the duct in metal boxes
Guide wire	Primary pulling of the cord or steel cable
Danger warning tape	Protection against future digging
Sealing or mastic tape	Seal spaces between the KANALEX duct and connection I, connection II - CP and other accessories
Protection tape or PVC film	Protection of sealing or mastic tape
4" x 3" reduction	Receive duct with thread for climbing the pole
CS connection	Join KANALEX in the underground, pre-cast concrete box
Transition connection	Join KANALEX with KANADUCT

3. DIMENSIONS AND DEFINITIONS

3.1 – KANALEX CORRUGATED DUCT

KANALEX is a corrugated duct with excellent radius of curvature, made of High Density Polyethylene (HDPE), which develops in a helicoidally towards the longitudinal axis with a constant pitch (Figure 4, Table 6).



Figura 4

Table 6 – DIMENSION CHARACTERISTICS

Nominal Ø Inches	Outer Ø D (mm)	Inner Ø d (mm)	Length (m)	ROLL SIZE		
				25 m	50 m	100 m
1 1/4"	41.3	31.5	50 – 100	- x -	0.85 x 0.32	1.10 x 0.32
1 1/2"	56.0	43.0	50 – 100	- x -	1.00 x 0.31	1.10 x 0.44
2"	63.4	50.8	50 – 100	- x -	1.15 x 0.35	1.25 x 0.53
3"	89.5	75.0	50 – 100	- x -	1.35 x 0.45	1.45 x 0.70
4"	124.5	103.0	50 – 100	- x -	1.85 x 0.50	2.00 x 0.75
5"	155.0	128.0	25 – 50	1.72 x 0.46	2.03 x 0.63	- x -
6"	190.0	155.0	25 – 50	2.21 x 0.43	2.60 x 0.60	- x -
7"	202,0	176,0	25 – 50	2.30 x 0.62	2.60 x 0.62	- x -
8"	250.0	206.0	30	- x -	2,80 x 0,80	- x -

Note: The above described values are for reference only.

3.2 - PLUG / TERMINAL

HDPE piece in a threadable, circular section for plugging corrugating ducts and finishing in the box wall (Figures 5 and 6, Table 7).

This accessory is supplied only in the original plug shape, and in order to convert it into a terminal, this is obtained making a cut along length L, using a knife, starret saw or other cutting object.

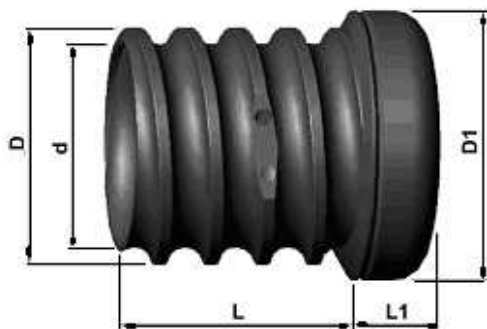


Figura 5

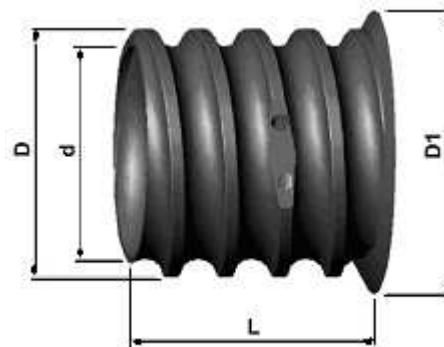


Figura 6

Table 7 – DIMENSION CHARACTERISTICS

Nominal Ø	d (mm)	D (mm)	D1 (mm)	L (mm)	L1 (mm)
Inches					
1 1/4"	24.0	36.0	54.0	45.0	20.0
1 1/2"	33.0	43.5	70.0	72.0	23.0
2"	38.8	53.4	78.0	65.0	25.0
3"	58.6	83.5	110.0	80.0	36.0
4"	94.0	113.8	126.5	116.0	40.0
5"	114.0	142.0	182.0	175.0	50.0
6"	142.0	175.0	212.0	190.0	60.0
7"	160,0	184,0	215,0	170,0	55,0
8"	187.0	230.0	260.0	190.0	65.0

Note: The above described values are for reference only.

3.3 CONNECTION I

HDPE piece in a threadable, circular section, for joining corrugated ducts with the same nominal diameter (Figure 7, Table 8).

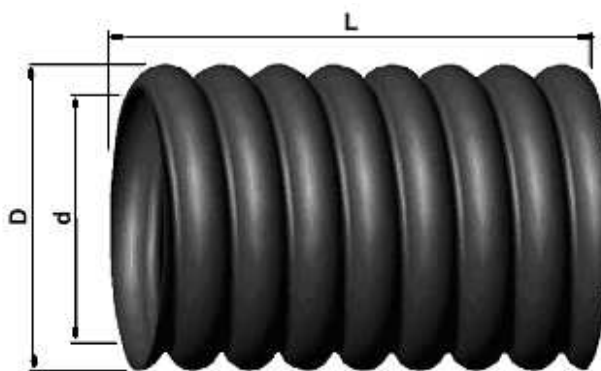


Figura 7

Table 8 – DIMENSION CHARACTERISTICS

Nominal Ø	d (mm)	D (mm)	L (mm)
Inches			
1 1/4"	37.0	46.0	70.0
1 1/2"	50.0	62.0	75.0
2"	58.0	71.0	100.0
3"	82.5	103.0	150.0
4"	113.0	133.5	200.0
5"	142.0	174.0	260.0
6"	175.0	208.0	270.0
7"	185,0	215,0	260,0
8"	223.0	270.0	310.0

Note: The above described values are for reference only.

3.4 CONNECTION II - CP

HDPE piece in a threadable, circular section, for joining corrugated ducts with other smooth face tubes of the same nominal diameter (Figure 8/ Table 9).

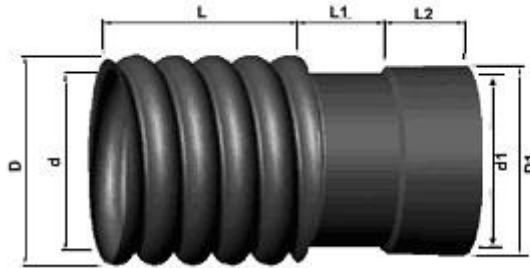


Figure 8

Table 9 – DIMENSION CHARACTERISTICS

Nominal Ø	d (mm)	d1 (mm)	D (mm)	D1 (mm)	L (mm)	L1 (mm)	L2 (mm)
Inches							
1 1/2"	49.0	49.0	62.0	-x-	75.0	40.0	-x-
2"	58.0	48.0	71.0	64.5	66.0	20.0	33.5
3"	82.5	73.0	102.0	93.0	96.0	25.0	40.0
4"	113.9	104.0	133.5	118.0	120.0	53.0	50.0
5"	142.0	130.0	174.0	145.3	170.0	40.0	60.0
6"	175.0	148.0	208.0	172.3	170.0	50.0	60.0

Note: The above described values are for reference only.

3.5 - LATERAL CLIMB

HDPE piece, in a threadable, circular section, for receiving smooth tubes for climbing the pole (Figure 9, Table 10).

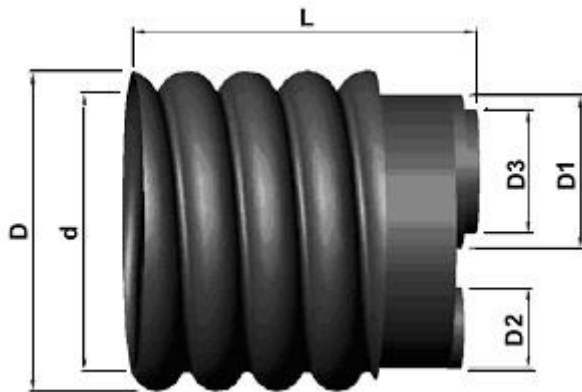


Figure 9

Table 10 – DIMENSION CHARACTERISTICS

Nominal Ø	d (mm)	D (mm)	D1 (mm)	D2 (mm)	D3 (mm)	L (mm)
Inches						
2"	58.0	71.0	36.0	- x -	- x -	140.0
3"	82.5	102.0	55.0	35.0	- x -	150.0

4"	113.9	133.5	64.0	52.0	34.0	155.0
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Note: The above described values are for reference only.

3.6 – CONE

Rubber piece, in a threadable, circular section, for sealing the end of the duct in the box wall or pole (Figure 10, Table 11).

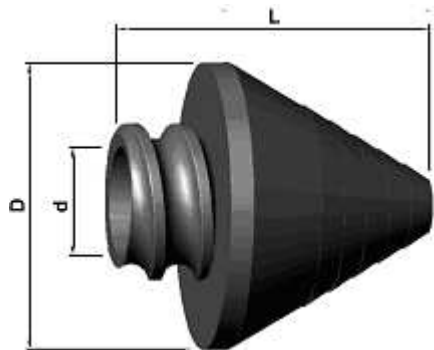


Figure 10

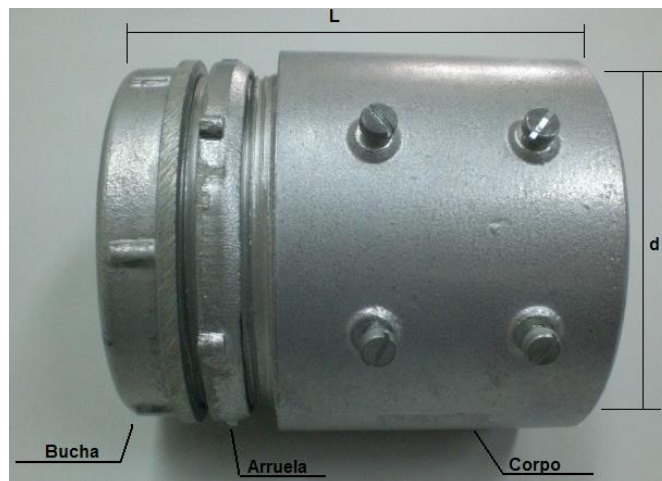
Table 11 – DIMENSION CHARACTERISTICS

Nominal Ø	d (mm)	D (mm)	L (mm)
Inches			
2"	41.0	72.0	74.8
3"	64.0	106.0	110.8
4"	82.0	148.0	159.6

Note: The above described values are for reference only.

3.7 - CM CONNECTION FOR METAL BOX

Aluminum piece, in a circular section, for affixing ducts to the metal boxes (Figure 11, Table 12).



Bushing Washer Body
Figure 11

Table 12 – DIMENSION CHARACTERISTICS

Nominal Ø	d (mm)	L (mm)
Inches		
1 1/4"	42.5	58.0
1 1/2"	56.0	71.0
2"	65.0	81.5
3"	91.0	99.0

4"	126.0	124.0
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Note: The above described values are for reference only.

3.8 – LATERAL CLIMB WITH THREAD (4" x 3" reduction)

HDPE piece in a threadable, circular section, for joining corrugated ducts with threadable, rigid, electrical ducts (Figure 12, Table 13).



Figure 12

Table 13 – DIMENSION CHARACTERISTICS

Nominal Ø (mm)	d (mm)	D (mm)	D1 (mm)	L (mm)	L1 (mm)
4" x 3" Gas	113.9	133.5	88.9	110.0	30.0

Note: The above described values are for reference only.

3.9 - KANALEX/KANADUCT TRANSITION I GLOVE

HDPE piece in a threadable, circular section, for joining corrugated KANALEX ducts with annealed Kanaduct ducts (Figure 13, Table 14).

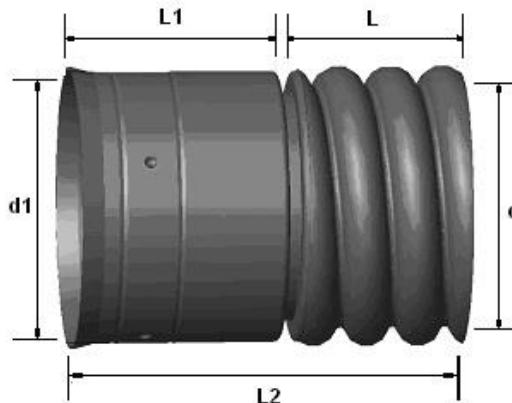


Figure 13

Table 14 – DIMENSION CHARACTERISTICS

Nominal Ø (mm)	d (mm)	d1 (mm)	L (mm)	L1 (mm)	L2 (mm)
4" x 110	112.0	111.2	81.0	90.0	180.0
4" x 125	112.0	126.0	81.0	100.0	197.0

Note: The above described values are for reference only.

3.10 - CS CONNECTION FOR 125 X 100 mm UNDERGROUND BOX

Threadable, circular section comprised of 3 parts (connection, ring and plug) for joining KANALEX corrugated ducts with underground pre-cast concrete box (Figure 14, Table 15).

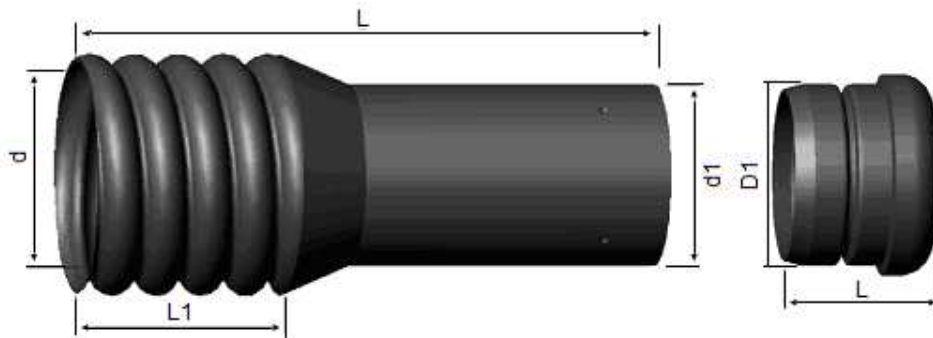


Figura 14

Table 15 – DIMENSION CHARACTERISTICS

Piece	d (mm)	D (mm)	D1 (mm)	L (mm)	L1 (mm)
Connection	112.5	100.0	- x -	250.0	85.0
Plug	- x -	82.0	93.0	80.0	- x -

Note: The above described values are for reference only.

3.11- GUIDE WIRE

PVC coated, galvanized steel wire supplied in the duct for primary pulling of the cord or steel cable. (Rupture load ≥ 50.0 Kgf)

3.12 - WARNING TAPE

Plastic film in LDPE (Low Density Polyethylene), 100 mm in width, for signaling the installation and protecting against future digging (Figure 15).



KANALEX – Careful! Danger! High Voltage Cable
 KANALEX – Careful! Danger! Telecommunications
 Figure 15

3.13 - SEALING OR MASTIC TAPE

Sealing or mastic tape in standard widths and variable lengths (Table 16) for sealing empty spaces between the duct and the connection, impeding the infiltration of outside agents, thus guaranteeing watertight splices (Figure 16).

If sealing or mastic tape is not used, we recommend the application of silicone, caulking compound, etc.

We remind you once again that the ends of the connections should not remain with any sealant in order to avoid the infiltration of liquids that may eventually damage wires or cables found inside the duct.

Provided in the form of a kit, containing 2 sealing or mastic tapes and 1 roll of protection tape or PVC film, protected by a plastic bag or cardboard box.

Table 16 – DIMENSION CHARACTERISTICS

Nominal Ø	Length of sealing or mastic tape (mm)	Width of sealing or mastic tape (mm)
Inches		
1 1/4"	160.0	25
1 1/2"	230.0	25
2"	280.0	25
3"	350.0	25
4"	420.0	25
5"	570.0	40
6"	700.0	40
8"	870.0	60



Figure 16

3.14- PROTECTION TAPE OR PVC FILM

Transparent PVC film, adherent by overlaying, aimed at protecting the sealing or mastic tape (Figure 17).

We recommend applying 5 to 6 layers of the PVC film over the sealing or mastic tape.

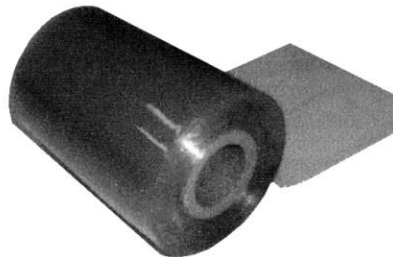


Figure 17

4. INSTALLATION

4.1 - OPENING THE DITCH

The width of the ditch is determined by the type of duct bank to be constructed and the space between them.

The height of the backfill should be at least 60 cm, and in cases where the load level is very high, it could vary between 100 and 120 cm.

If the bottom of the ditch is comprised of rocky or irregular material, apply a layer of sand or clean dirt and compact it, thus ensuring the integrity of the ducts to be installed.

If there is any water at the bottom of the ditch, we recommend applying a layer of gravel covered with sand, for drainage, in order to permit good compacting.

4.2 - ACCOMMODATION/SETTLING OF THE KANALEX DUCT INSIDE THE DITCH

a) Duct banks in sand/earth

KANALEX ducts completely do away with concrete casing, thus compacting between duct lines should be done manually with sand or earth at a minimum thickness of 3.0 cm (datum point A). After the last layer, fill with earth at 20 cm intervals using a mechanical compactor, comprising datum point B.

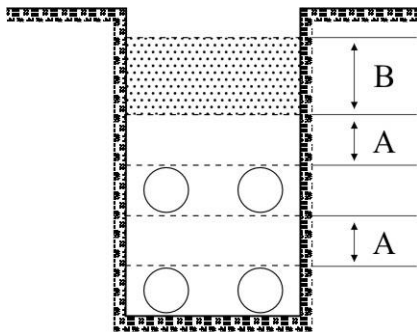


Figure 18

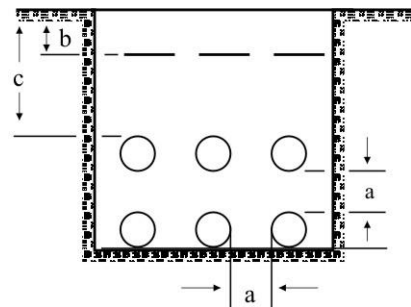


Figure 19

Table 17 – Load resistance

D A T U M	DISTANCE BETWEEN DUCTS AND LOAD RESISTANCE FOR ANY DUCT
a	3 cm
b	Distance between soil level and warning tapes is 20 cm.
c	Up to 20.0 tons. = 60 cm Above 20.0 tons = 1.00 to 1.20 m

Spacers help fill in all empty spaces, thus avoiding future sinking of the soil and/or movement of duct banks.

The distances between the spacers in curve points should be 0.80 m and 1.20 m at straight points.

These spacers can be wood or pre-cast concrete props, wood or iron forks/combs, which can be removed after filling in the empty spaces and reused along the line.

In order to speed up yield and minimize installation costs for creating the duct banks, we suggest making the removable “COMB” type wooden or iron spacer along the line, as shown in figure 20.

We remind you that for constant help at job fronts, use at least 2 pieces in the installation.

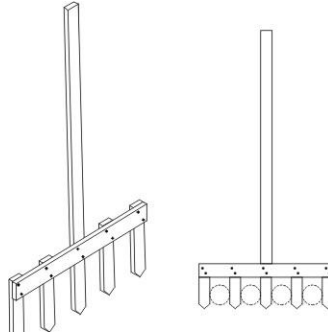
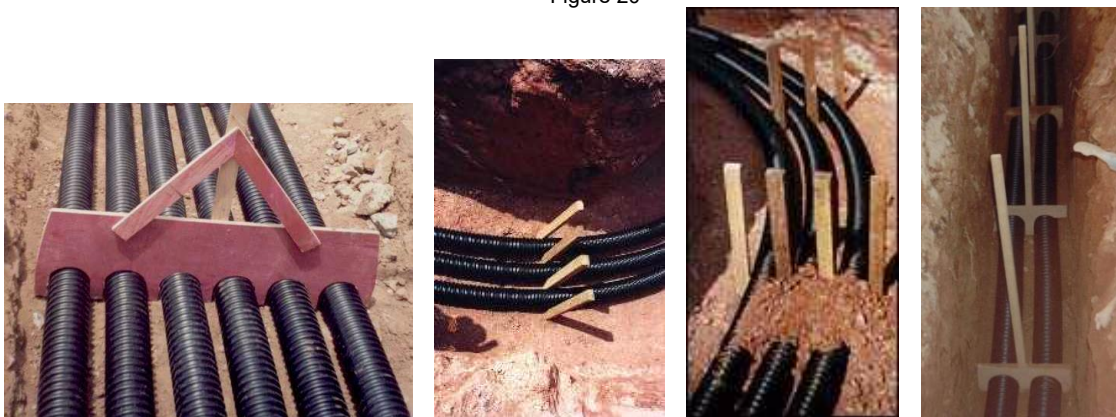


Figure 20



Illustrative Photos

b) Concrete duct bank

In the case of shallow ditches, that is, backfills of less than 60 cm, with heavy and intense traffic on the surface, while avoiding the concrete casing of ducts, we suggest the use of pre-cast concrete sheets or a 10 cm ballast of thin concrete immediately below the warning tapes (see datum point “b” in Figure 19).

If, due to excess load, there is any need to use KANALEX concrete casing, contact us and request the specific procedure from our Technical Assistance department.

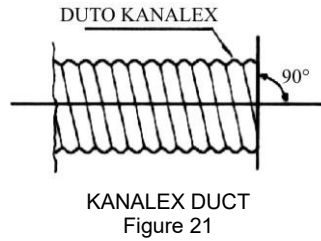
4.3 - SPLICES WITH KANALEX

The importance of a well-made splice aims at impeding the infiltration of any sort of liquid into the duct, which will grant longer useful life to the wires and cables they contain.

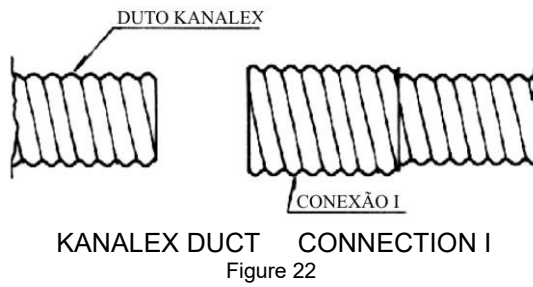
4.3.1- METHOD FOR SPLICING KANALEX DUCTS USING CONNECTION I

Procedure:

- a) Cut the ends of the ducts to be spliced, forming a 90° angle in relation to the longitudinal axis, using connection I as a cutting guide, without leaving any burrs (Figure 21).



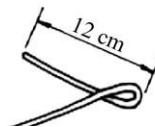
b) Keep connection I screwed into one of the ducts (Figure 22).



c) Splice the guide wires.

Procedure:

c1) Bend the wire forming a link, with a 12 cm extension (Figure 23).



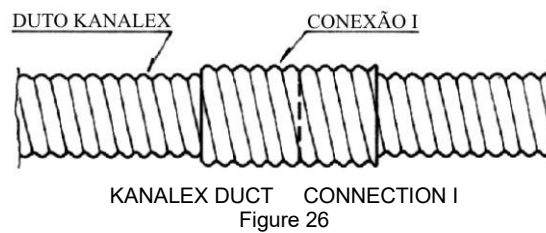
c2) Hold the end of the extension and twist the wires together (Figure 24).



c3) Introduce the other guide wire through the eyelet, repeating points c1 and c2 (Figure 25).



d) Position the top ducts and return connection I until it overlays the ducts equally (Figure 26).



e) Apply the sealing or mastic tape and then the protection tape around the entire perimeter of connection I (Figure 27).

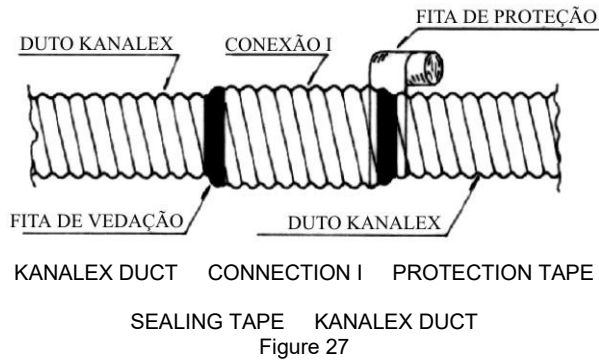


Figure 27

4.3.2 - METHOD FOR SPLICING KANALEX DUCTS AND SMOOTH TUBES USING CONNECTION II CP

- a) Cut the end of the duct to be spliced forming a 90° angle to its longitudinal axis.
- b) Completely screw connection II (CP) into the corrugated duct and introduce the smooth tube into the other end (Figure 28).

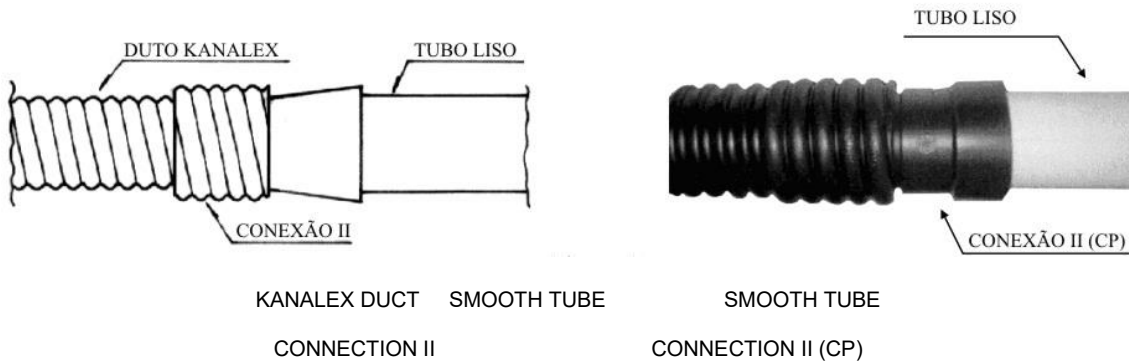


Figure 28

- c) Apply the sealing tape, followed by the protection tape (Figure 29).

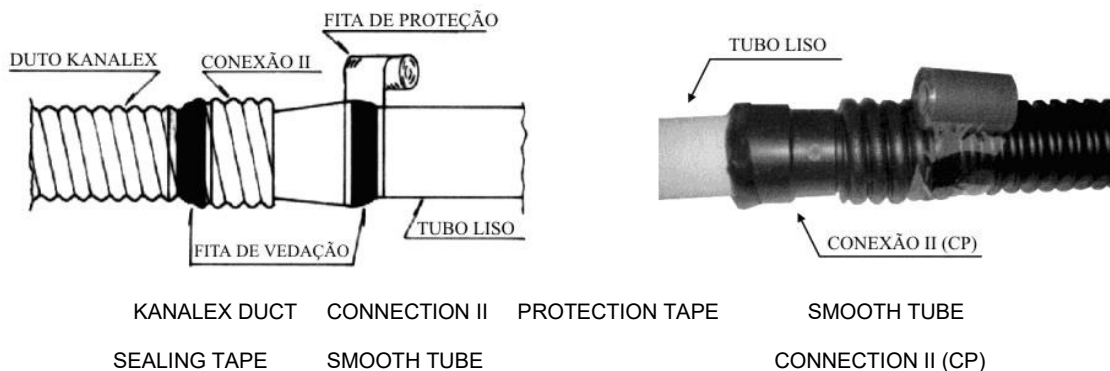


Figure 29

4.3.3 - SPLICES IN CURVES

Avoid the splicing procedure with Connection I and Connection II (CP) in curves; however, when making them, keep a minimum distance of 2 meters before them. The splicing procedures are as described previously in items 4.3.1 and 4.3.2.

4.4 - RECOVERY OF THE PAVEMENT

The intermediate layers between ducts should be compacted manually using 3 cm of earth or sand, taking all necessary care to ensure all empty spaces are filled.

The vertical and horizontal distances between ducts should be kept in accordance with what is established in the project. If the earth is excessively dry, dampen it enough to permit proper compacting.

This process consists of spraying water at each duct level and special care should be taken to avoid any outflow of earth and floating of ducts.

Compacting of soil above the last layer of ducts should be done using a “frog”, “pen” or “vibratory” mechanical compactor at layers no more than 20 cm thick.

When the last layer of compacting is made, at a depth of approximately 20 cm below soil level, place the warning tape above each duct line.

4.5 - ARRIVAL AT THE BOX

Upon arrival at the box, we recommend covering the ducts in concrete, aimed at their parallelism and perpendicularism.

This layer of concrete should be replaced by duly compacted earth or sand.

This procedure aims at a perfect alignment of the ducts, forming a 90° angle to the box wall, as shown in Figure 30.

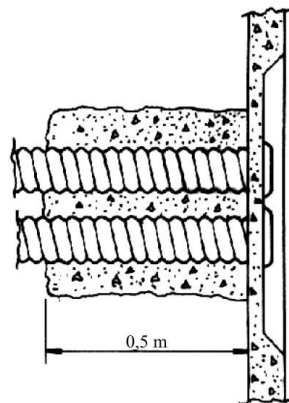
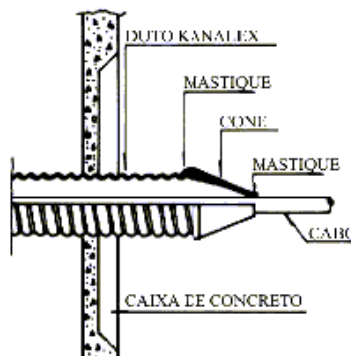


Figure 30

4.5.1- MODEL OF INSTALLATION USING THE CONE

Use of the cone ensures perfect water tightness of the installed duct line in those cases where the boxes remain constantly under water (Figure 31).



- KANALEX DUCT
- MASTIC
- CONE
- MASTIC
- CABLE
- CONCRETE BOX

Figure 31

4.5.2- MODEL OF INSTALLATION IN PANELS

Fixation in panels is done using connection CM (Figure 32).

- Connection CM blocks the duct;

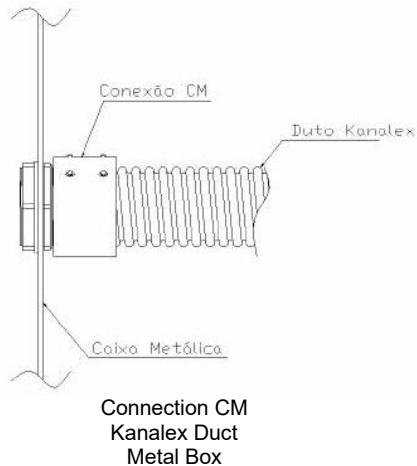


Figure 32

4.5.3- MODEL OF INSTALLATION WITH LATERAL CLIMB

For an exit to a pole to be well-made, we recommend a deepening of the duct bank in order to form a curve with a maximum radius of curvature to avoid any blocking of cables (Figure 33). We also recommend casing the accessory in concrete. The figure below is merely illustrative.

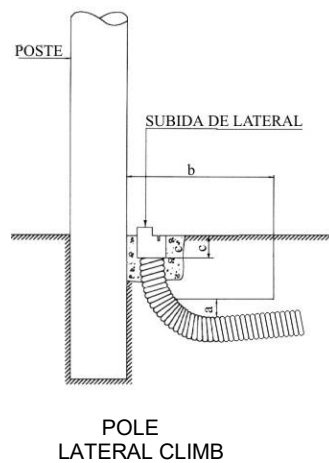


Figure 33

4.6 – INSPECTORS

The use of inspectors aims at verifying the existence of undesirable external agents inside the ducts as well as out-of-spec curves. These pieces can be made of wood or aluminum, with rounded faces (Figure 34, Table 18).

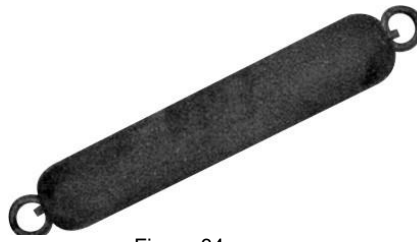


Figure 34

Table 18 – DIMENSION CHARACTERISTICS

Nominal Ø		Inspector length L (mm)	Inspector Ø D (mm)
Inches	mm)		
1 1/4"	30	200	23
1 1/2"	40	200	32
2"	50	200	38
3"	75	200	56
4"	100	400	80
5"	125	400	96
6"	150	400	116
8"	200	600	150

4.6.1- APPLICATION

- a) Tie the guide wire to one end of the inspector and a pulling cable to the other. The latter can be a steel cable, sisal rope, etc.
- b) Then, pull the guide wire and introduce the inspector into the inside of the duct until reaching the other end (Figure 35).

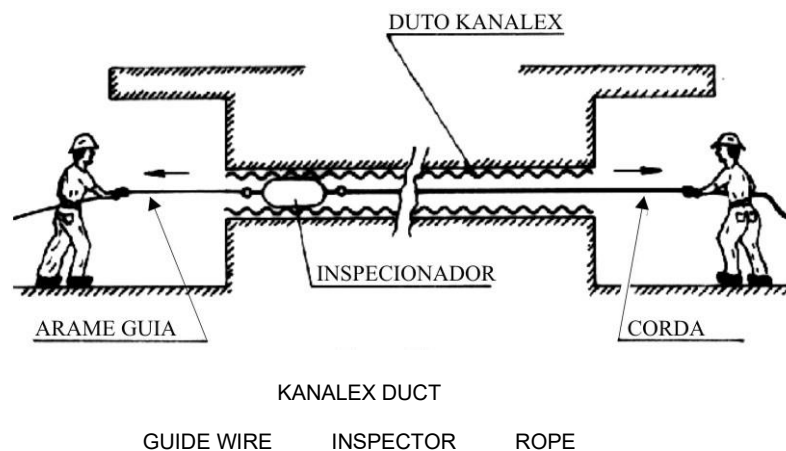


Figure 35

5- PULLING THE CABLES

With the rope or steel cable inside the duct, it will traction the wires or cables with the help of a pulling sleeve or swivel joint (Figure 36).

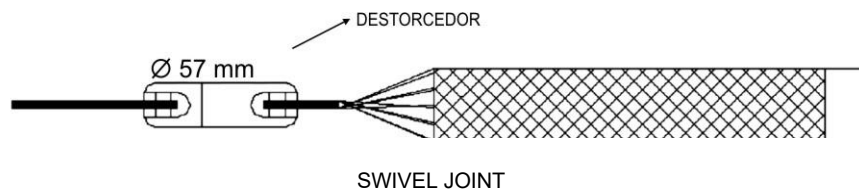


Figure 36

While pulling the wires and/or cables, the guide wire can be reintroduced into the duct to facilitate any sort of future operation, such as: laying additional cables or changing already existing ones.

6 – METHOD FOR REPAIRING KANALEX DUCTS

Types of damage:

A. LIGHT DAMAGE

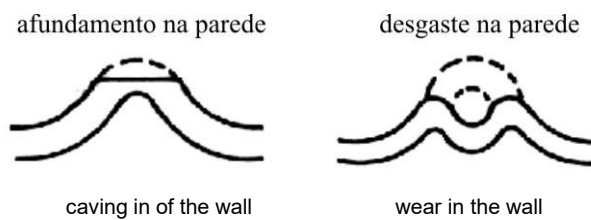


Figure 37

Light damage does not need repairs.

B. AVERAGE DAMAGE

- holes in up to 5 corrugations

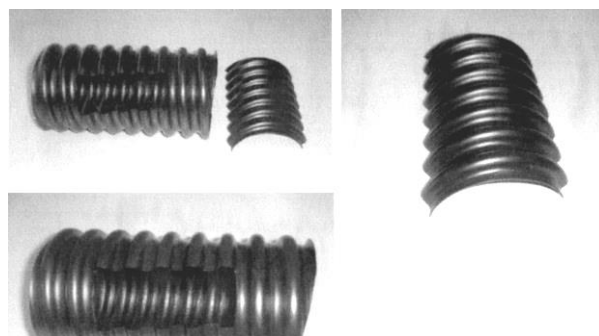


Figure 38

Repair: should be carried out as described below:

1. Place a duct fuller over the damaged area
2. Sealing tape (mastic)
3. Protection tape (PVC Film)

Apply the tapes so the fuller is completely covered.

or

- Remove the section of damaged duct and replace it with another
- Screw the two connections I (Figure 39).

- Join the guide wires
- Apply the sealing tape and the protection tape (Figure 40).

C. HEAVY DAMAGE

- complete breakage of the installed duct

C.1 – NO CABLE INSTALLED

Repair:

- remove the section of damaged duct and replace it with another
- screw together two connections I
- join the guide wires
- apply the sealing tape and the protection tape.

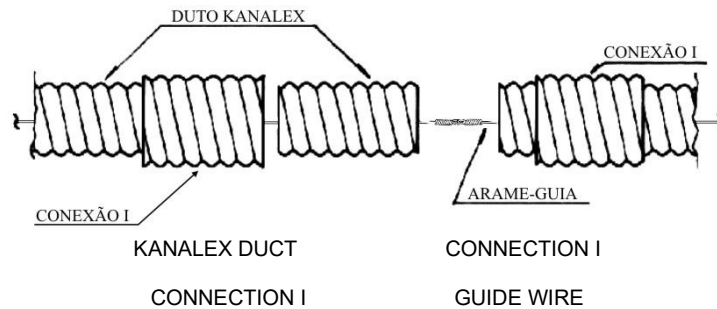


Figure 39

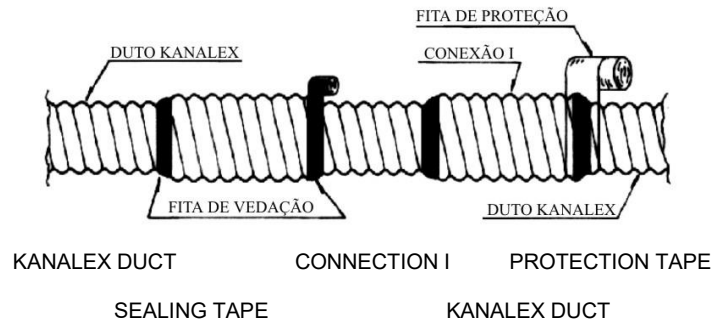
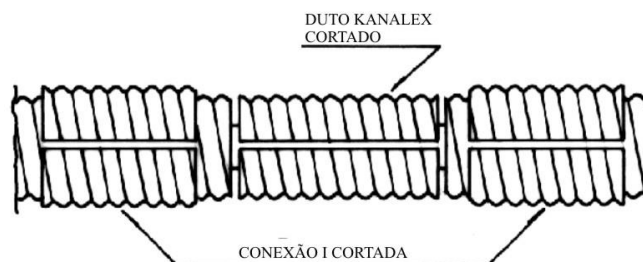


Figure 40

C.2 – WITH CABLE INSTALLED

Repair:

- remove the section of damaged duct and replace it with another cut longitudinally
- screw two connections I together, cut longitudinally
- join the guide wires, if any
- apply the sealing tape and the protection tape.



CUT KANALEX DUCT
CUT CONNECTION I

Figure 41

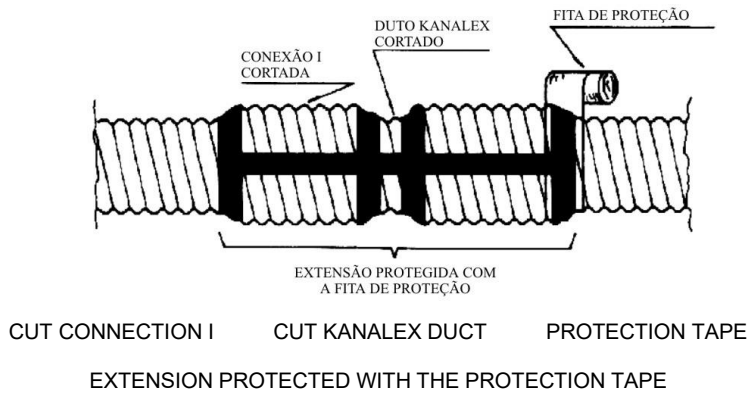


Figure 42

7. SHIELDING THE END OF THE KANALEX DUCT

KANALEX ducts are totally waterproof and in order to avoid the penetration of any sort of liquid into the duct after laying the cables, we carry out a process called "SHIELDING". The objective is to impede the flow of liquids between underground boxes or the passing of liquids between duct lines.

Shielding is made as described below:

- a) Remove the KANALEX duct plug, transforming it into a terminal (Figure 43).

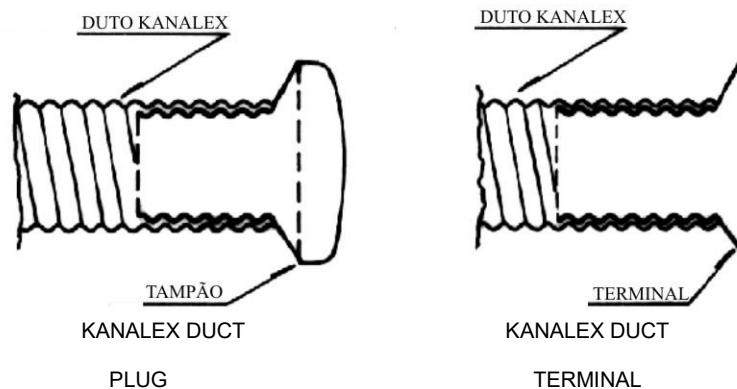


Figure 43

- b) After that operation, reintroduce the terminal into the duct, thus obtaining arrival at a conventional box (Figure 44).

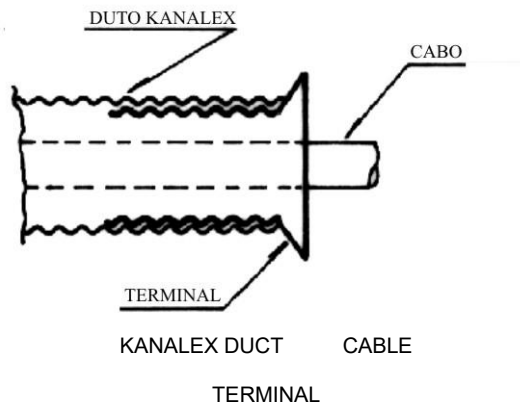


Figure 44

- c) Fill in the space encompassed between the cable and the terminal with a layer of rag forming a bulkhead and thus blocking the material applied later from penetrating inside the duct as shown in Figure 45.

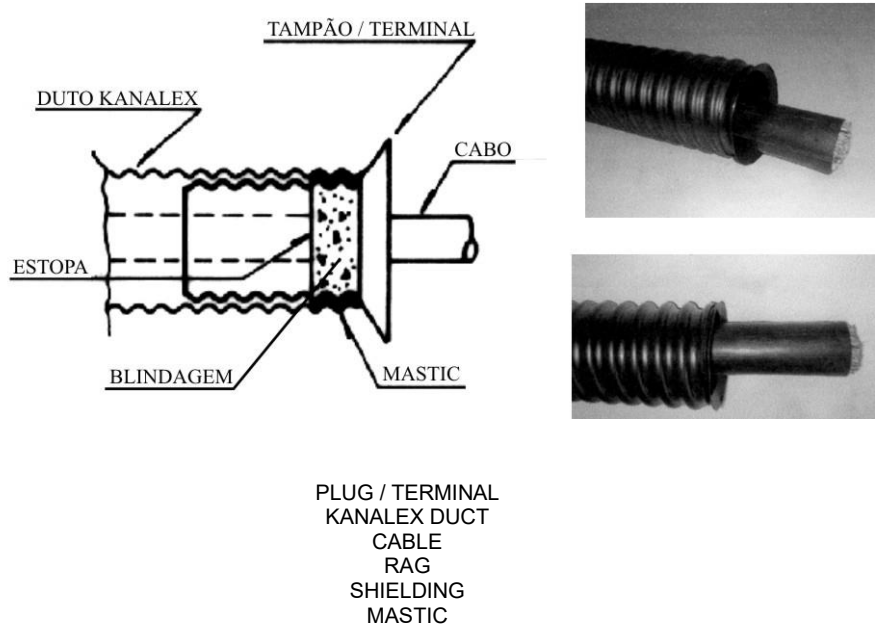


Figure 45

- d) Shielding should at least fill in the first three spires of the terminal. The material used for shielding may be dry wall, white cement, mortar, caulking compound or mastic.
- e) The existing space between the duct and the terminal should be filled with mastic.

8 – CARE IN HANDLING AND TRANSPORTATION

a) Transport/Handling

During the transportation and handling of ducts and accessories, avoid impacts, attrition or contact with elements that may compromise their integrity, such as: metal or sharp objects with sharp edges, stones, etc. Unloading should be done carefully and should not permit the laying of ducts directly into the soil to avoid the concentration of loads at a single point. We suggest the use of two parallel boards, as shown in Figure 46, thus facilitating the unloading of ducts.

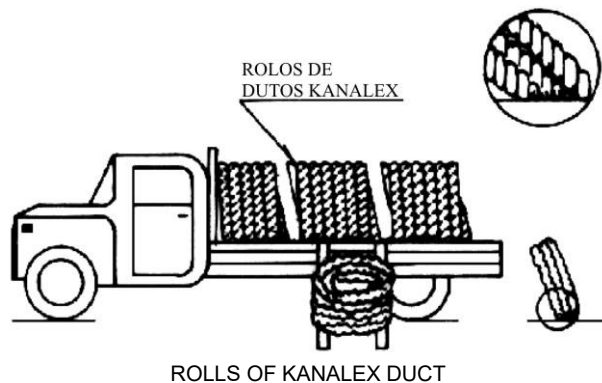


Figure 46

Table 19 – OCCUPATIONAL CAPACITY BY TRUCK

Nominal Ø		SINGLE REAR-AXLE				GRAIN				MOVING			
Inches	(mm)	25 m	30 m	50 m	100 m	25 m	30 m	50 m	100 m	25 m	30 m	50 m	100 m
1.1/4"	30	- x -	- x -	140	100	- x -	- x -	310	200	- x -	- x -	200	162
1.1/2"	40	- x -	- x -	110	60	- x -	- x -	190	110	- x -	- x -	170	100
2"	50	- x -	- x -	60	50	- x -	- x -	120	90	- x -	- x -	100	80
3"	75	- x -	- x -	50	25	- x -	- x -	90	45	- x -	- x -	80	35
4"	100	50	- x -	25	15	90	- x -	45	30	80	- x -	30	25
5"	125	30	- x -	16	- x -	56	- x -	30	- x -	35	- x -	25	- x -
6"	150	20	- x -	13	- x -	35	- x -	25	- x -	24	- x -	17	- x -
8"	200	- x -	7	- x -	- x -	- x -	15	- x -	- x -	- x -	12	- x -	- x -

Single rear-axle: 6.0 m (length) x 2.4 m (width) x 2.8 m (height)

Grain: 12.0 m (length) x 2.4 m (width) x 2.8 m (height)

Moving: 10.0 m (length) x 2.4 m (width) x 2.8 m (height)

b) Storage

Storage should be in places where there are no elements that could damage the material, such as: metal or sharp objects, stones, rigid surfaces with sharp edges, glass, etc.

The rolls should be arranged horizontally (lying down) and stacked at a maximum of 4 units. They should not be exposed outdoors for a period longer than 12 months. If it is necessary to store them for a period longer than stipulated above, we recommend covering the ducts with canvas or in covered locations so there is no reduction in useful life.

9 - ASSAYS

9.1 – DIAMETRAL COMPRESSION ASSAY

A test body measuring 500 mm in length is submitted to compression force F to cause diametral deformation of 5% in relation to the outer diameter.

This assay should be conducted at a temperature between 20 and 25°C.



Figure 47

9.2 - IMPACT ASSAY

A test body measuring 500 mm in length is submitted to impact from a solid mass cylinder equal to 5 Kg and Ø 90 mm, in free fall from pre-determined heights.

The duct shall not present any internal diametral deformations greater than 10% for ducts with Ø 30, 40 and 50 mm and greater than 6% for those with Ø 75, 100, 125 and greater than 5% for those with Ø 150 mm and 200 mm, and it will not crack or have any imperfections visible to the naked eye.

This assay should be conducted at a temperature between 20 and 25°C.

9.3 - TRACTION ASSAY

The test body for the traction resistance assay shall be constituted of a duct measuring 400 ± 10 mm in length for diameters of 30, 40, 50, 75 and 100 mm and 500 ± 10 mm for diameters of 125 and 150 mm.



Figure 48

Then, apply force F (N) between the terminals until rupture, at a constant speed of 5 mm/minute. This force should not be less as shown in Table 21. This assay should be conducted at a temperature between 20 and 25°C.

Table 21 – MECHANICAL CHARACTERISTICS

Nominal Ø	Minimum F
Inches	(N)
1 1/4"	2000
1 1/2"	2000
2"	2000
3"	4000
4"	5000
5"	5000
6"	6500

NOTES

- 1) Kanaflex S.A. Indústria de Plásticos has the continuous improvement of those products it manufactures as its core principle. Eventual changes may be made in this technical manual without prior notice aimed at such improvement.
- 2) The purpose of this technical manual is to collaborate with Kanalex users in underground canalization jobs. If any particularities or doubts arise in your jobs that are not contemplated in this manual, please contact our Technical Assistance Department.
- 3) Kanaflex has and provides technical assistance services at job sites. This service aims at orienting installers regarding the correct procedure for duct installation and cannot be considered an inspection. Our technicians are instructed to not interfere in engineering procedures and projects, which are the responsibility of the contractors and installers.

Doubts?

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