

**ROULUNDS**

# CONVEYOR BELT



## TYPICAL ARRANGEMENT FOR BELT CONVEYORS

Typical profile of belt conveyors and nomenclature of their elements are shown on Fig. 1.

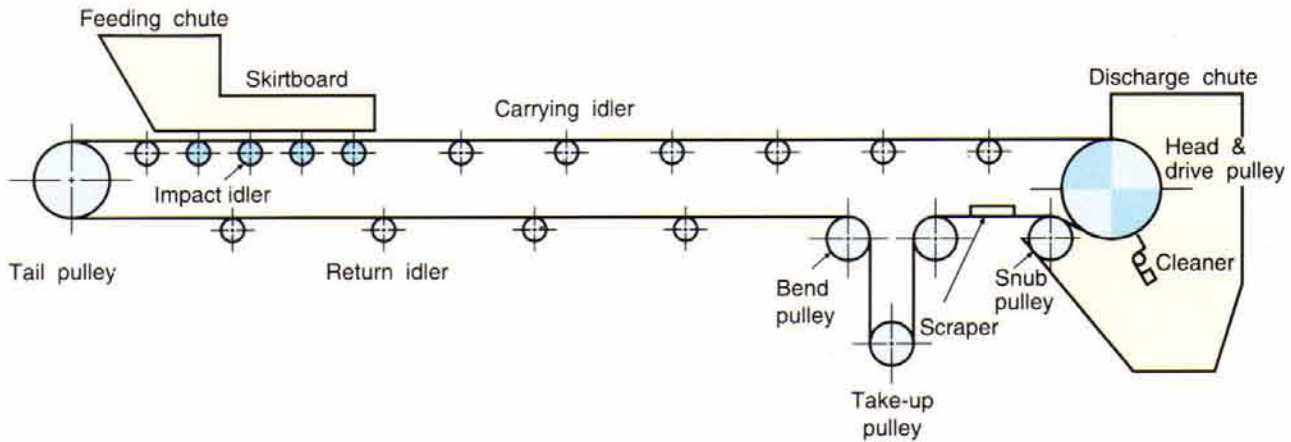


Fig. 1 Typical Profile of Belt Conveyors

## CONSTRUCTION

Conveyor belts generally consist of cover rubber, carcass and coating rubber (See Fig. 2)

### ■ Cover Rubber

The cover rubber is for protection of carcass from damages such as the load, water, etc also gives the necessary friction between belt and driving pulley and between belt and material.

Depending upon working conditions, various types of rubber being wear resistant, oil and/or heat resistant, antistatic, incombustible, chemical resistant, etc are required. Sometimes, cover types that combine two or more of these properties are required too.

### ■ Carcass

The carcass is for transmitting tensile forces from the driving pulley, absorbing the impact which occurs in loading material onto conveyor and carrying the belt with material over the carrying idlers.

The most common materials of carcass are used such as nylon, polyester, vinylon, cotton, etc.

### ■ Coating Rubber

To maintain good adhesion of carcass, specially compounded coating rubber is used.

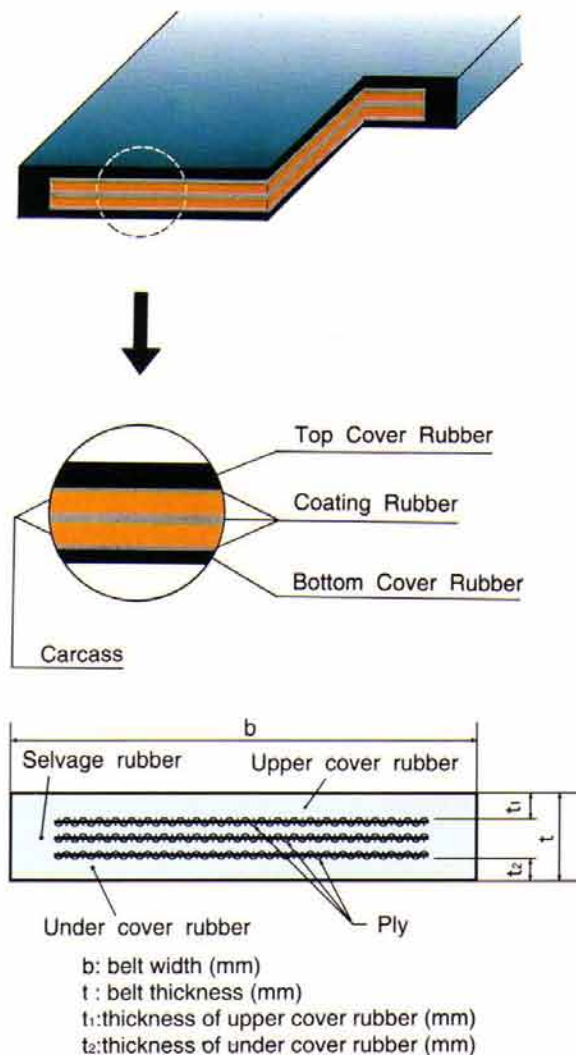


Fig. 2 Construction



## PROPERTIES

### ■ Cover Rubber

Standard grade and thickness for cover rubber are described on Table 1 and Table 2 respectively.

Table 1. Standard Grade

Grade	Service Condition	Min. Tensile Strength (kg/cm <sup>2</sup> )	Min. Elongation at Break(%)	Maximum Temperature(°C)
M	Used for high tension conveyor belts Superior in abrasion-resistance and cut-and-gouge resistance. Suitable for conveying large sized lumps, sharp and rugged materials.	250	450	Normal Temp.(60°C)
N	Used for high tension conveyor belts Superior in abrasion-resistance but inferior to grade M in cut-and-gouge resistance.	200	400	Normal Temp.(60°C)
B C	Used for general light duty service. Suitable for conveying moderately abrasive materials and small sized materials	160 140	400 350	Normal Temp.(60°C) Normal Temp.(60°C)
SA	Super abrasion resistant Suitable for conveying materials tending to cause fast wear on belts.	200	450	Normal Temp.(60°C)
OHR	Oil & Heat Resistant Having oil resistance, though not great and suitable for conveying hot materials. Recommendable for conveying the containing some mineral oil.	100	300	Max. Temp. of Material handled : 100°C
OR	Oil Resistant Excellent in oil resistance. Suitable for lubricating oil, Animal fat, Mineral oil, Oil treated coal, Phosphate involved oil, Vegetable oil, Fish oil, Com oil, etc.	120	300	Normal Temp.(60°C)
HRS	Superior in heat resistance and also in cut, abrasion and tear resistance. Suitable for conveying the following materials: Hot sintered ore, hot pallet, hot clinker, hot chemical, fertilizer, etc.	100	300	Max. Temp. of Belt Surface : 130°C Ave. Temp. of Material handled
HRB	Highly excellent in heat resistance and also superior in abrasion resistance and cut-and-tear resistance. No cracks will result, so suitable for hot materials such as hot clinker, hot cement, hot powder, hot sintered ore, hot chemical and fertilizer.	100	300	Max. Temp. of Belt Surface : 180°C Max. Temp. of Material handled : 400°C
FR	Fire Resistant Resistant to flame propagation, extremely low burning rate. Suitable for underground operation.	100	350	100°C

Table 2. Standard Thickness

Material Handled	Belt Length in Meter											
	Below 40				30 to 150				Over 120			
	TOP		BOTTOM		TOP		BOTTOM		TOP		BOTTOM	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
Non-Abrasive: Fine Coal, Wood Chips, Grain Chips, Ash Cement, etc.	3.2	1/8	1.6	1/16	1.6	1/16	0.8	1/32	0.8	1/32	0.8	1/32
Slightly Abrasive: Sand, Earth, Bituminous Coal, Clay, Salt, etc.	4.8	3/16	1.6	1/16	3.2	1/8	1.6	1/16	3.2	1/8	1.6	1/16
Very Abrasive: Undressed Coal, Crushed Stone, Gravel Coke, etc.	6.4	1/4	3.2	1/8	4.8	3/16	1.6	1/16	4.8	3/16	1.6	1/16
Extremely Abrasive: Limestone, Metal Ores, Slag Iron, Glass, etc	9.6	3/8	4.8	3/16	6.4	1/4	3.2	1/8	6.4	1/4	3.2	1/8

## ■ Carcass

Conveyor belts can be classified by sort and strength of carcass as follows.  
Max. rated tensions for carcass are shown on Table 3.

### Nylon Fabric(NN) Conveyor Belt

Nylon fabric is the principal material of the carcass, which nearly has all necessary properties as the tension member of conveyor belt.

#### - Application

Speed, High Tension, Deep Trough, Heavy Duty, Long Span.

#### - Properties

- High tensile Strength
- High Impact Resistance
- High Bending Resistance
- Wide Selection Available
- Little Flexuous Fatigue
- Light Weight
- High Adhesion Strength
- Excellent Resistance to Water

### Polyester/Nylon(EP) Conveyor Belt

This belt consists of a synthetic woven fabric with polyester fibre for warp and a polyamid( nylon) fibre for weft and has low elongation.

#### - Application

Short Take-up Travel, Heavy Duty, High Speed, Deep Trough, Long Span, High Tension.

#### - Properties

- Low Elongation
- High Tensile Strength
- High Impact Resistance
- Tear Resistance
- Superior Heat Resistance

### Cotton Duck(CC) Conveyor Belt

The carcass of conveyor belt was originated from cotton fabric, which has been used for a long time.  
Cotton ducks of 28, 32 & 36 oz weight are available.

Table 3. Max. Rated Tension

Carcass		Tensile Strength in kg/cm · ply	Max. Rated Tension in kg/cm · ply	Carcass		Tensile Strength in kg/cm · ply	Max. Rated Tension in kg/cm · ply
Nylon	NN 100	100	8.3	Polyester /Nylon	EP 100	100	8.3
	NN 120	120	10.0		EP 125	125	10.4
	NN 150	150	12.5		EP 160	160	13.3
	NN 180	180	15.0		EP 200	200	16.7
	NN 200	200	16.7		EP 250	250	20.8
	NN 250	250	20.8		EP 315	315	26.3
	NN 300	300	25.0		EP 400	400	33.3
	NN 350	350	29.2	Cotton Duck	28 oz	45	3.7
	NN 400	400	33.3		32 oz	50	3.8
	NN 500	500	41.7		36 oz	55	4.2



## TYPES OF CONVEYOR BELT

Conveyor belt products are classified by properties and shapes of cover rubber. Refer to table 1 & 2 for properties of cover rubber.

### ■ Oil Resistant Conveyor Belt

Oil contaminated belts cause ordinary cover rubbers to swell and peel off. A complete breakdown in the conveyor system is caused by this swelling as the swollen belt prevents it from passing over idlers and around pulleys. Oil resistant conveyor belt is for the transportation of oil-drenched metal machining chips, oily sheet metal, foodstuff such as bulk beans and culls, and processed meats and fish.

### ■ Heat Resistant Conveyor Belt

Hanchang heat resistant conveyor belt is suitably designed to transport materials with high temperature. As conveyor belt may have damages, such as crack and abrasion of cover rubber and separation between plies or rubber and ply, by heat, it is more economical to use heat resistant conveyor belts for materials whose temperature is over 60°C. Transported materials are such as sand for casting, coke, cement, sintered ore, clinker, chemical fertilizer, food, dry clay, etc.

### ■ Abrasion Resistant Conveyor Belt

In operating belt conveyor, the excessive abrasion of normal belt is caused by the material being transported, idlers and pulleys. Hanchang abrasion resistant conveyor belt is to extend the life of the belts operating under severe working conditions, with specially compounded rubber.

### ■ Fire Resistant Conveyor Belt

In order to eliminate the fire risk especially at the places not easily accessible, there have been recently increased demands for fire resistant conveyor belt in coal mines.

### ■ Chemical Resistant Conveyor Belt

This Belt is adopted when conveyed material is chemicals, pulp, ceramic, foodstuffs or fertilizer. Depending upon the characteristics of material transported, cover rubber is acid resistant or alkali resistant.

### ■ Conductive Conveyor Belt

To prevent charging with static electricity, specially compounded rubber is used for cover. This belt is effective where there is a danger of fire due to sparks of static electricity and a adhesion between the belt surface and material carried.

### ■ Color Conveyor Belt

This belt is adopted to match ambient color of service places and to ensure safety and health of workers.



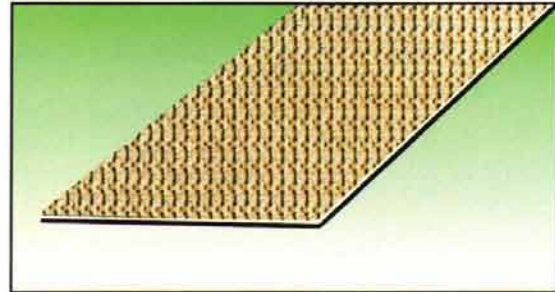
### ■ Concenter Conveyor Belt

This type of belt is very effective in transporting bags as well as powder along the steep incline. The transportation incline angles are  $17^{\circ}$  to  $28^{\circ}$  and  $30^{\circ}$  to  $35^{\circ}$  for bulk material and bagged material respectively.



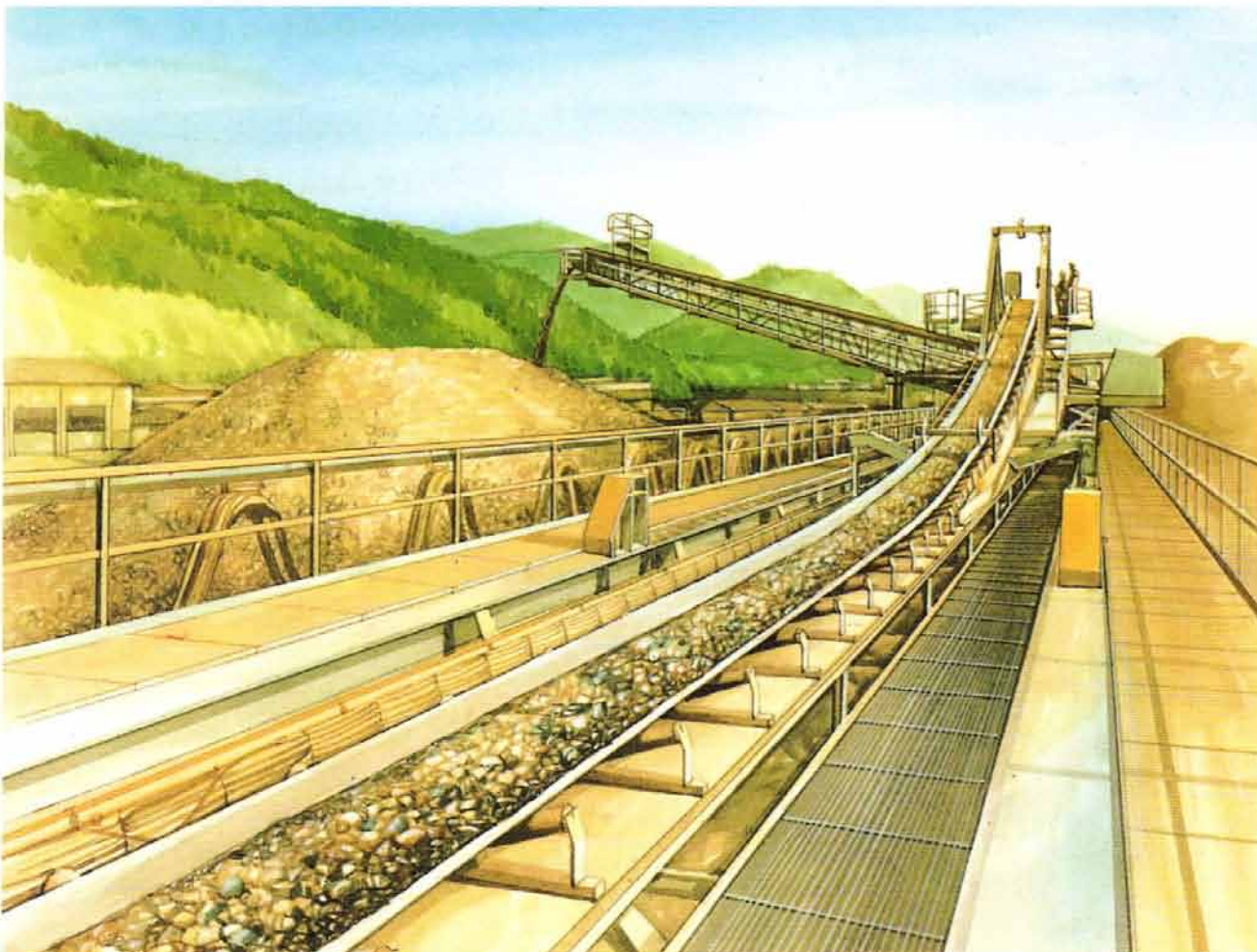
### ■ Rough Top Conveyor Belt

As this belt has the large friction of belt surface, transportation at inclined angle  $25^{\circ}$  to  $30^{\circ}$  is feasible.



### ■ Corrugated Sidewall Conveyor Belt

Larger carrying capacity is achieved with reinforced corrugated walls and transverse cleats. Also inclined angle is improved up to  $75^{\circ}$ .



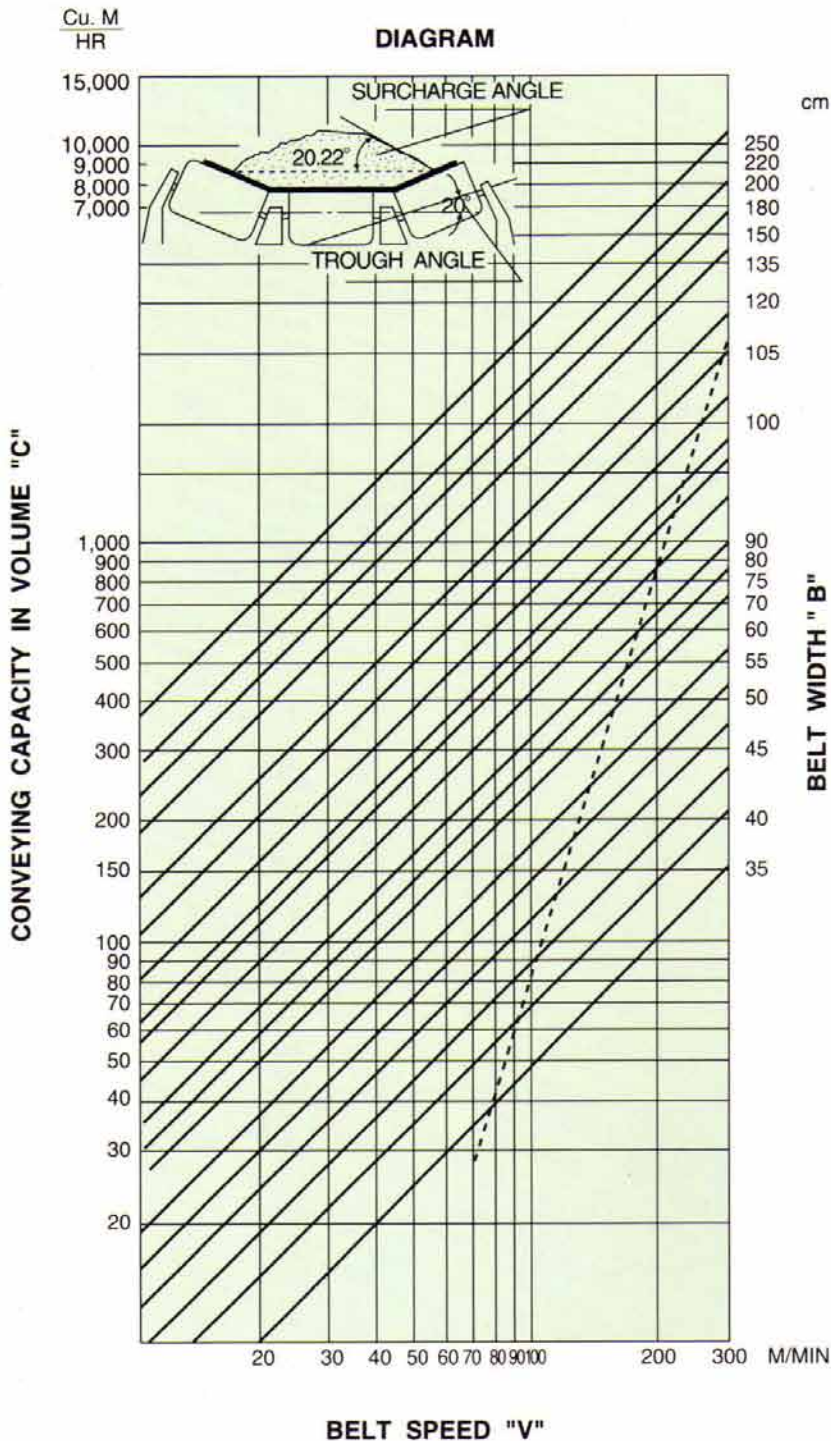


## BELT SELECTION

The under-mentioned four conditions should be known previously;

- The maximum lump size and bulk weight (Ton/Cu. m)
- Tonnage carried (Ton/hr)
- Horizontal conveying distance (meter)
- Height of lifting (meter) and angle of inclination.

The selection of suitable belt width and speed can be done by using the Diagram shown below left. This Diagram is based on 20° troughed carriers, and shows conveying capacity in volume (Cu. m) per hour that is a quotient of conveyed tonnage per hour divided by bulk weight(T/Cu. m).



Conveying capacity in volume "C" has been calculated from the following formula;

$$C = 7.47(0.9B - 0.05)^2 \cdot V \text{ in Cu. m}$$

B : Belt width (m)  
V : Belt speed (m/min)

For instance, in case of a certain kind of coal, bulk weight is 0.8 ton/Cu.m, figure of C can be calculated from the following formula;

$$C = Q/0.8 \text{ in Cu. m}$$

Q: Tonnage (ton/hr)

## SPLICING BY VULCANIZATION

Splicing length shall be calculated from the below formula.

$$L = l_1 + l_2 = S(n-1) + l_2$$

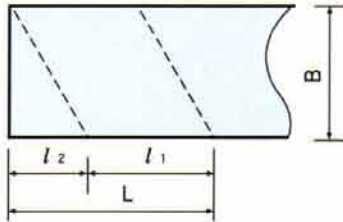


Fig. 5 Splicing Length

where,

- L : Total splicing length (mm)
- $l_1$  : Length of spliced section (mm)
- $l_2$  : Margin for splicing angle (mm) - See Table 4
- S : Step length (mm) - See Table 5
- n : Number of plies
- B : Belt width (mm)

Table 4. Margin for Splicing Angle,  $l_2$

Belt Width, B (mm)	$l_2$ (mm)
Under and Equal to 600	B/2
Over 600, Under and Equal to 900	300
Over 900	B/3

Table 5. Step Length, S

Types of Fabric	NN 100, NN 120 EP 125	NN 150, NN 180 EP 160	NN 200	NN 300, EP 250, EP 315	NN 400	NN 500
Step Length (mm)	120	180	200	300	400	500





## PACKING

The package for shipment of conveyor belts can be classified by two different types as shown on Table 6.

Table 6. Package for Shipment

Type of Package	Gross Weight (or Outside Dia.) of Package
Simple Package	Below 3 tons (or 1.8 m dia.)
Wooden Drum	Above 3 tons (or 1.8 m dia.)

**Note:** The outside diameter of package shall be within 3.3 times of its width so as to stabilize the package.

### ■ Wooden Drum Package (See Fig. 3)

#### - Diameter of Drum

$$D = \sqrt{d^2 + \frac{L \times C}{0.0785}} + 15$$

where,

- D = Drum diameter (cm)
- d = Core diameter (cm)
- L = Belt length (m)
- C = Thickness of belt (mm)

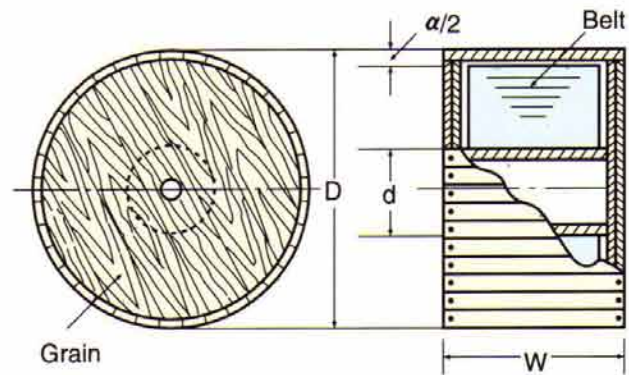


Fig. 3 Wooden Drum Package

#### - Width of Drum

$$W = B + 0.25$$

where,

- W = Width of drum (m),
- B = Width of belt (m)

#### - Gross Weight

$$G = W_1 \times L \times \beta$$

where,

- G = Gross Weight (kg),
- $W_1$  = Weight of belt (kg/m),
- L = Length of belt (m),
- $\beta$  = Coefficient of Drum Weight only (1.2)

### ■ Simple Package (See Fig. 4)

#### - Diameter of Drum

$$D = \sqrt{d^2 + \frac{L \times C}{0.0785}} + 5$$

#### - Width of Drum

$$W = B + 0.10$$

#### - Gross Weight

$$G = W_1 \times L + 30\text{kg}$$

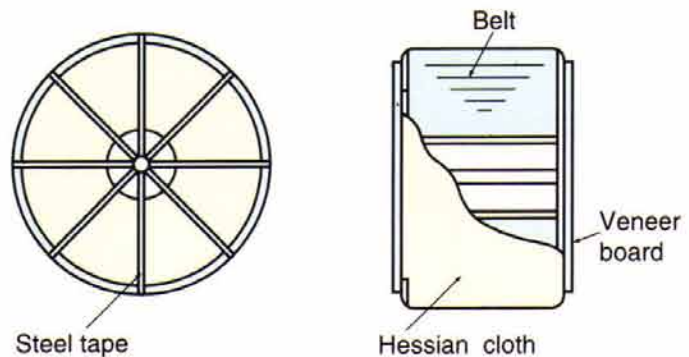
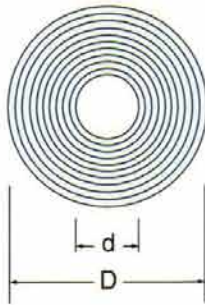
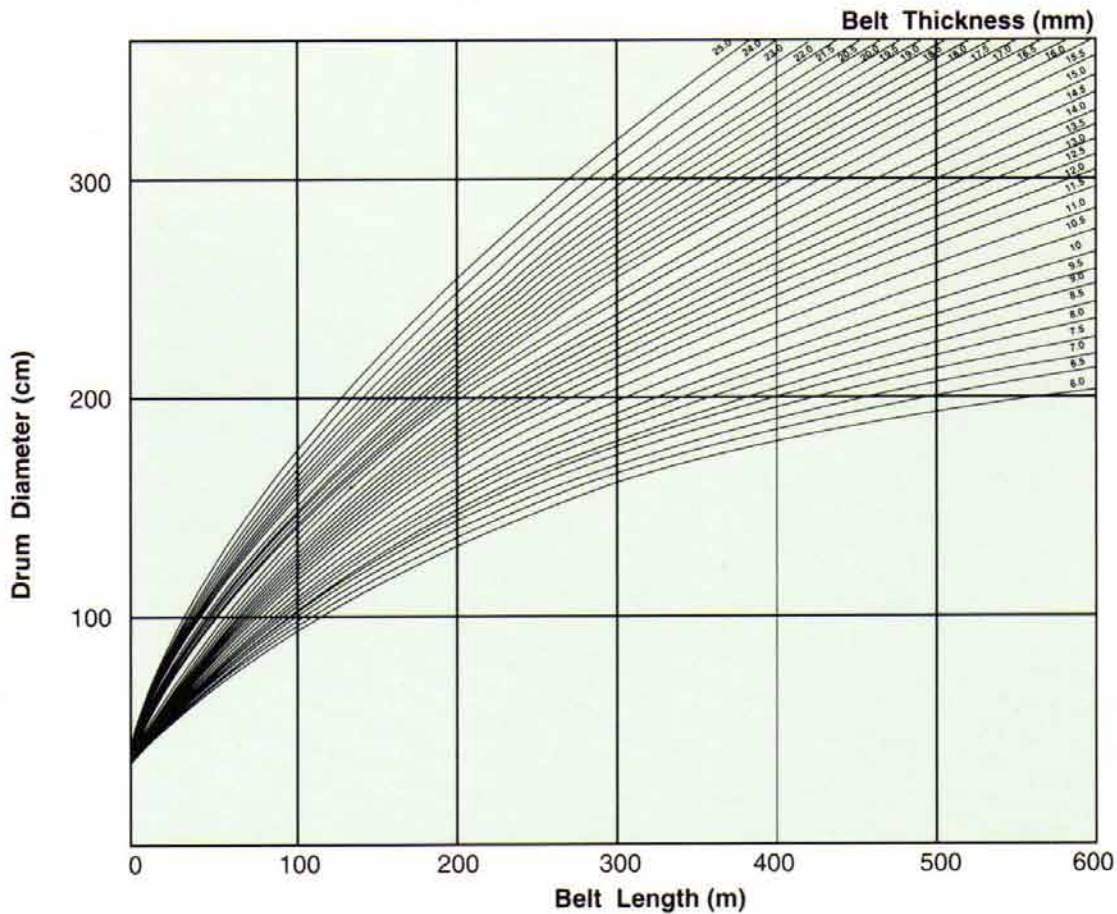


Fig. 4 Simple Package

## DIAMETER OF ROLLED BELT

Relation of Belt Thickness and Belt Length With Reeled Diameter of Belt.



Calculation Method of Belt Length

$$L = \left( d + \frac{D-d}{2} \right) \pi \times N$$

L : Belt Length (m)  
d : Dia. of Core (m)  
D : Dia. of Rolled Belt (m)  
N : No. of Times Rolled

Belt Thickness	Dia. of Core
~ 25.0 mm	600 mm
25.1 mm ~ 35.0 mm	800 mm
35.1 mm ~	1,000 mm

## STORAGE OF BELTS

The belts shall be stored for a long period in accordance with the followings.

The warehouse shall:

- be dry and cool — 10°C to 20°C — and be well ariated.
- have a relative humidity of approx. 65%
- be screened from direct sunlight.
- not be used for storage of acids, lubricants and dissolvents, the vapours of which may damage the rubber cover of the belts.

The below location shall be suitable for storage:

- Belts rolls must never be placed direct on floor and never laid on their edges which may cause obliquities of belt.
- When storing for long periods the rolls shall be fitted with a transverse shaft and be placed on a bearing frame.
- At intervals the rolls shall be turned in order that the inner pressure does not continuously affect the sample spot.