ROLLER MANUAL

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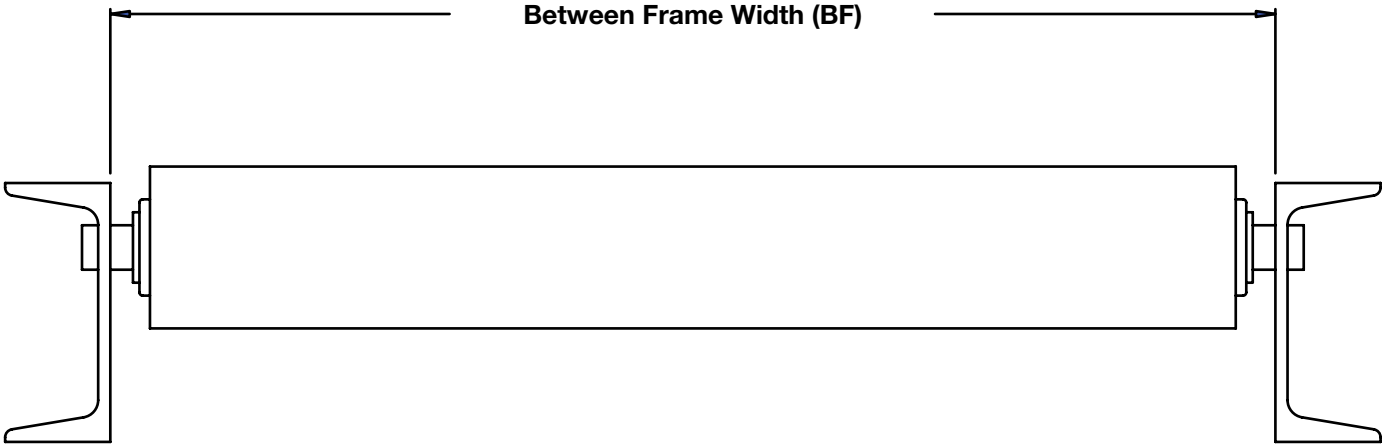
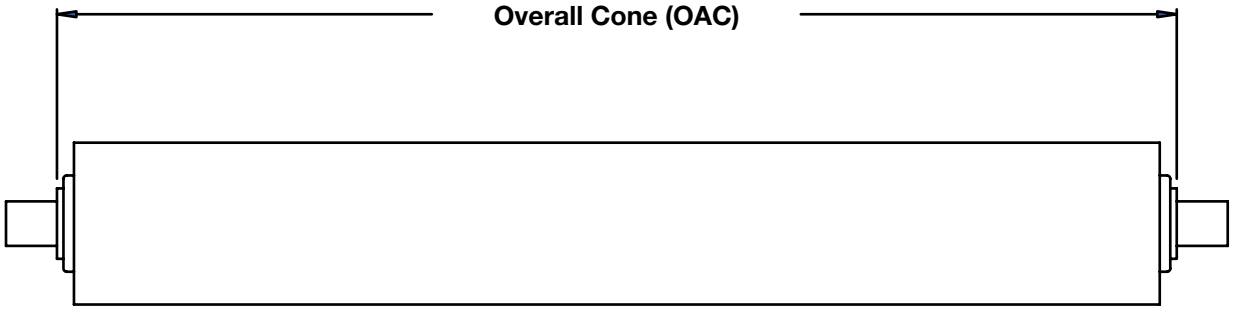
WHAT IS BF?



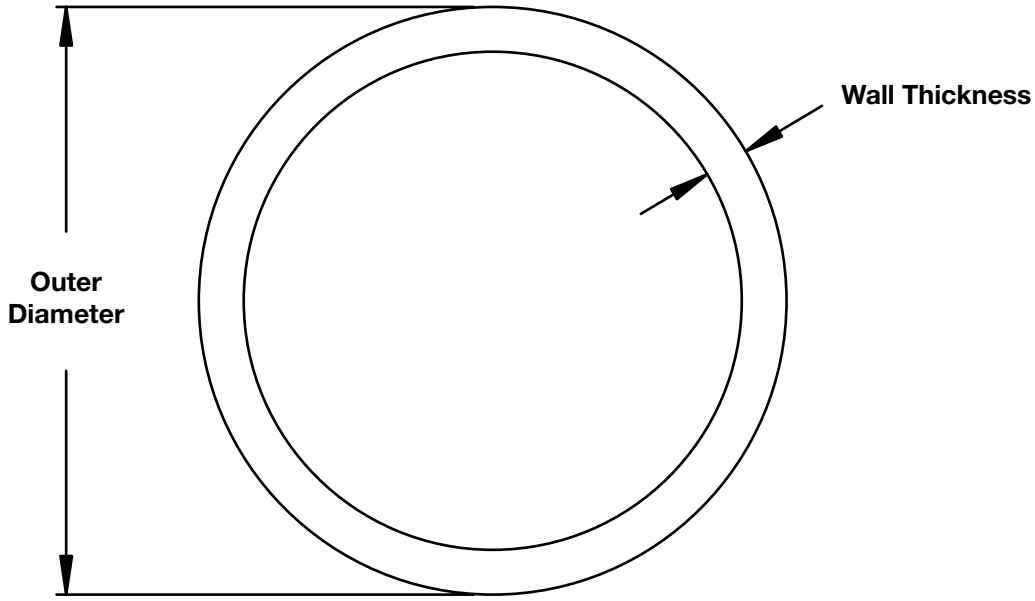
- The distance between the side frames of a conveyor is the “Between Frame” dimension or “BF”.



- The length of the roller from bearing tip to bearing tip is the “Overall Cone” or “OAC”.
- The OAC is 1/8" shorter than the BF for rollers up to 3.5" diameter. For rollers over 3.5" diameter the OAC is 3/16" shorter than the BF.

BF and OAC are more important than Tube Length.

- Tube length is not an accurate way to measure the length of a roller because it is dependent on how far the bearings protrude from the tube and therefore changes with different bearings.

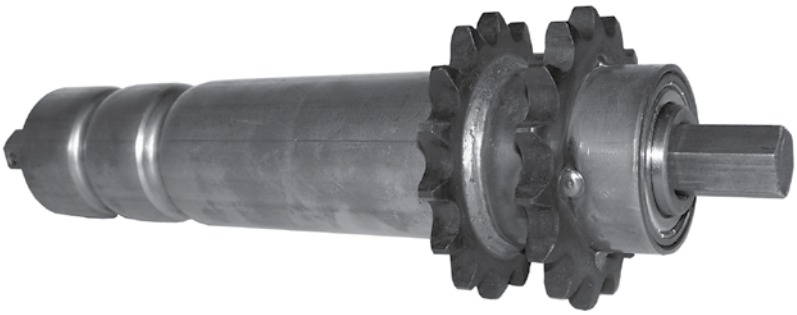


- Tubes are specified by the Outer Diameter (OD) and the thickness of the tube wall.
- The most common roller tube sizes are 1.9" OD x 16 ga. and 2.5" OD x 11 ga.
- Omni offers tube diameter sizes ranging from 1" to 8".
- Omni offers tubes made from these materials:
  - Mild (low-carbon) Steel
  - Galvanized Steel
  - Stainless Steel
  - Aluminum
  - PVC
  - Industrial Steel Pipe
- Steel tubes can be heat treated which increases the surface hardness and makes the tube more resistant to abrasions and small impacts.

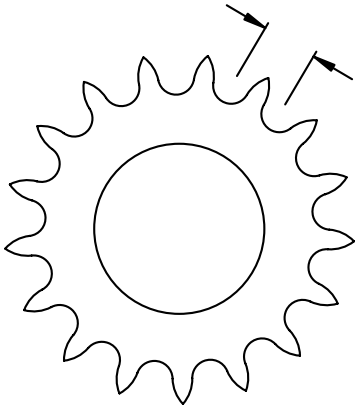
There is a difference between tube and pipe.

- Pipe is specified by Inner Diameter (ID) and a Schedule number that represents wall thickness.
- The most common pipe size for rollers is 1-1/2 SCH 40 which has an outer diameter of 1.9".
- Pipe is industrial grade and can have a very rough finish.

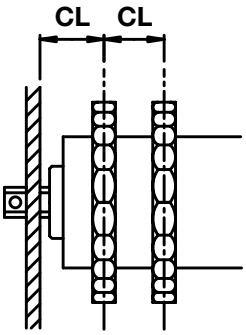
SPROCKETS



- Sprockets are welded to tubes for use with chains.
- Typically used in Chain Driven Live Roller conveyor.



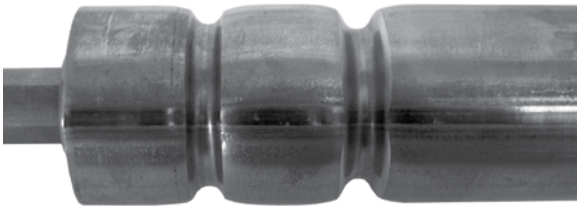
- Sprockets are specified by the Chain Pitch and Number of Teeth.
- The chain pitch specifies the distance between the teeth.

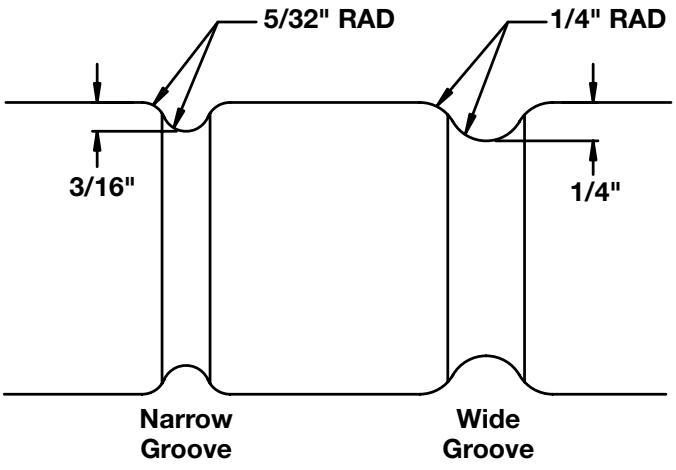


- Sprocket locations are measured from the inside face of the side frame to the centerline of the sprocket.
- Each additional sprocket is measured from centerline to centerline.
- Location of sprockets, chain size, and number of teeth must be specified.

GROOVES

- Grooves can be formed into certain tubes for use with O-rings.
- Typically used in Line Shaft Conveyors.
- Location and size of grooves must be specified.

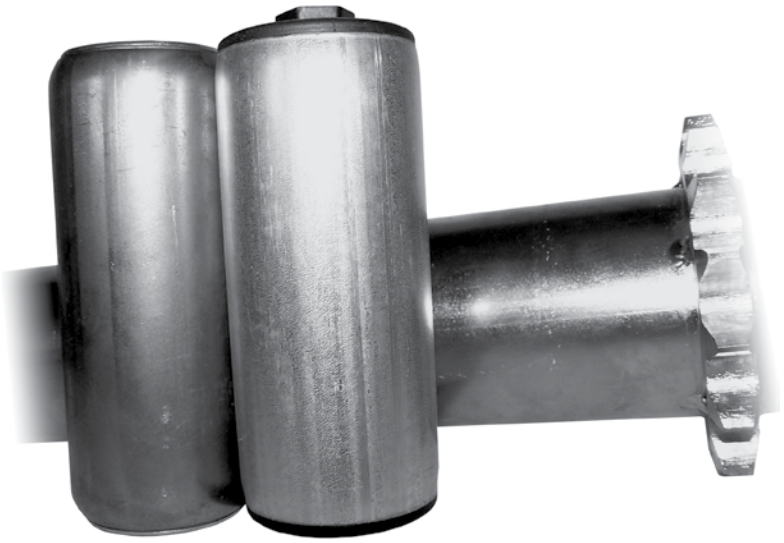




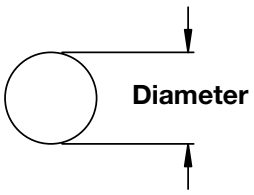
- Omni has two standard grooves sizes, narrow and wide.
- Narrow Grooves are 5/16” wide and made for 3/16” dia. belt.
- Wide Grooves are ½” wide and made for ¼” dia. belt.

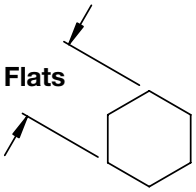
COATINGS & PLATINGS

- Coatings reduce impact to product, reduce scuffing to product, create more friction between roller and product, and protect the tube from abrasion
- Material type, durometer, and thickness must be specified.
- Omni offers rollers coated with these materials:
  - Urethane
  - Plastisol
  - Neoprene
  - Teflon
  - Vinyl
  - Other



- Platings protect the surface of the tube from corrosion and abrasion while enhancing appearance.
- Omni offers rollers plated with these materials:
  - Zinc
  - Chrome
  - Nickel
- Galvanized tube is steel tube with a thin layer of zinc plating that is applied during the fabrication process of the tube. It is thinner than hot-dipped zinc plating which is applied after the tube is made.

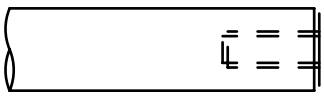




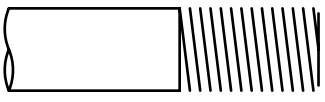
- Axles are generally round or hex shaped.
  - Hex axles are specified by the length across the flats.
  - Round axles are specified by their diameter.
- The most common axle sizes are 7/16" hex and 11/16" hex.
- Omni offers axles made from either Mild Steel or Stainless Steel.
- Axles are generally retained by a spring (A) or cotter pins (C).
- Springs are held in place with dimples stamped into the material (E). Cotter Pins are put into holes drilled thru the axle (B).
- Other axle retention methods include:
  - Hog Rings (axle D)
  - Spring Both Ends
  - Fixed or Staked

AXLE MACHINING

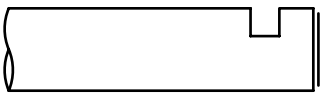
- Axle Machining offers other options for retaining the axle.
- Some axle machining operations include, but are not limited to:



Drilled and Tapped

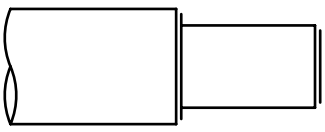


Threaded

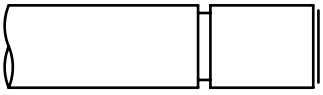


Milled Slot for Keeping Bar

Milled Flat



Turned



Snap Ring Groove

- Bearings are the most complex and critical part of a roller.
- Bearings come in a wide variety of sizes, shapes, and features that all offer different performance characteristics.
- Omni has a large offering of standard bearings but is capable of utilizing most types of bearings for custom applications.
- Some common bearing features are shown below.

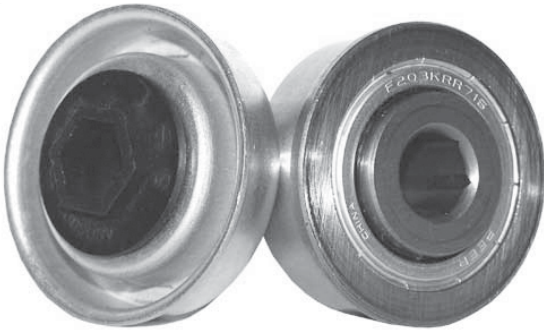
Bearing capacity does not dictate roller capacity.

- Roller load capacity is usually dictated by axle or tube deflection.
- Higher capacity bearings in a long roller will not necessarily change the load capacity of the roller.
- Bearing capacity is usually the limiting factor of roller capacity only at short BF's.

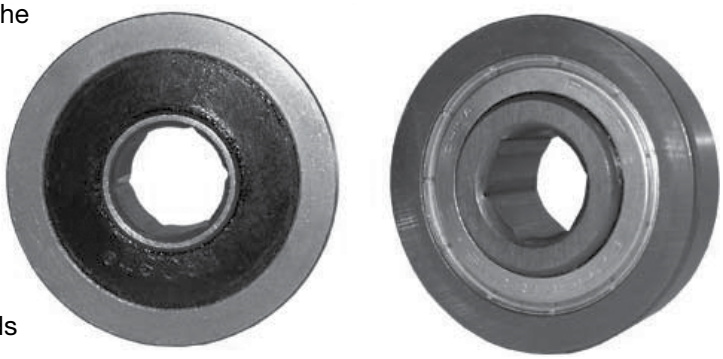
- Flanged bearings have a lip around the body which prevents the bearing from being pressed too far into a tube.

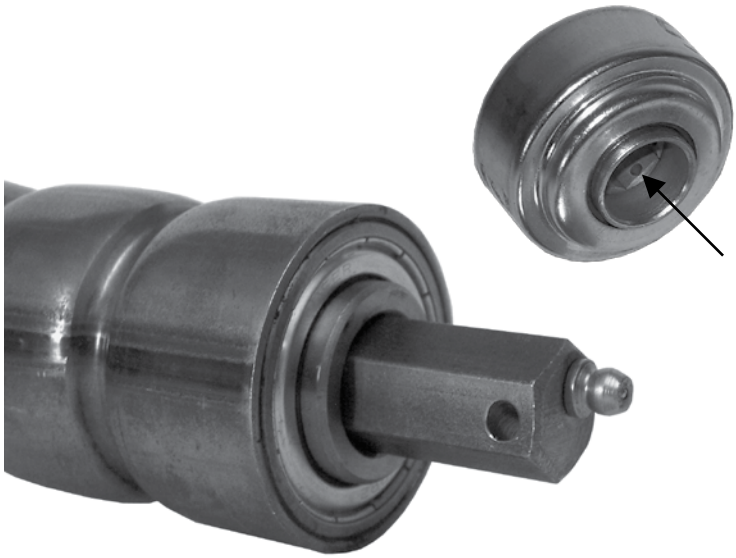
- Unflanged bearings have a cylindrical body that can be pressed completely into a tube. These bearings can be recessed fully into the tube.

- Stamped bearings (left) are housed with sheet metal that is stamped or formed around the components.
- Machined bearings (right) are housed with solid machined steel which holds much tighter tolerances than stamped bearings.



- Sealed bearings (left) have soft seals covering the balls that protect them from contamination and prevent grease from leaking.
- Seals can be made from:
  - Rubber
  - Nylatron
  - Teflon
  - Felt
  - Other
- Shielded bearings (right) have hard metal shields that cover the balls and protect them from contamination.





- Regreasable bearings have a hole through the inner race that allows grease to be directed into the bearing through specially drilled channels and a grease zerk in the axle.

- Unground (Non-precision) bearings are made of a stamped metal housing with very loose tolerances. They include a full complement of balls which are not separated. They are not intended for very high loads or high speeds.

- Semi-Precision bearings have machined metal housings with tighter tolerances than unground bearings. They also include a ball retainer to keep the balls separated and evenly spaced around the bearing. This makes them capable of higher speeds and higher load capacities than unground bearings.

- ABEC (Precision) bearings are made from high quality steel, heat treated to uniform hardness and ground to a micro finish. The tolerances are much tighter than semi-precision bearings. This makes them capable of even higher speeds and higher load capacities but sensitive to deflection and misalignment.

- Radial Bearings have a very basic shape. They have no flanges and both races are the same width. Radial ABEC bearings are usually metric with a round bore that is meant to press onto a shaft. They are difficult to fit into a tube correctly. Making a roller with radial ABEC bearings can be very labor intensive and impractical.

- Polypropylene Housed Bearings consist of a radial ABEC bearing inside a polypropylene housing assembly. The outer housing is much easier to fit into tubes without damaging the radial bearing. The inner adapter allows the bearing to fit onto different axles, usually hex shaped. The “poly” housing must be crimped into tubes and is not replaceable.

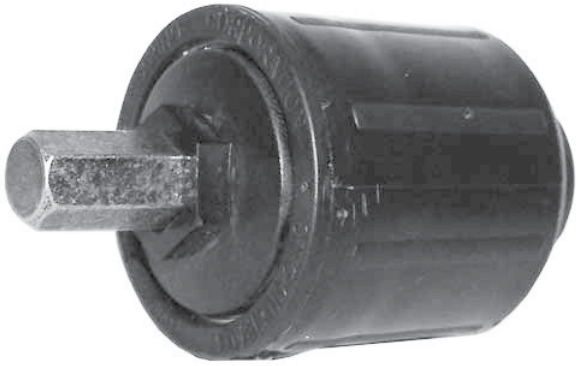
- Omni’s All Metal ABEC bearings are custom radial ABEC bearings. They are modified with larger body diameters, hex bores, extended inner races, and flanges. They offer all the benefits of poly housed ABEC bearings but are more durable and do not require a crimp, which means they are replaceable.

- Insert bearings are ABEC bearings designed for use in housing units like pillow blocks. They are characterized by set-screws, or some other mechanism, on an extended inner race that locks the inner race to the axle. They can only be pressed into roller tubes if they have a cylindrical body.

- Agricultural (AG) bearings are similar to insert bearings but lack the ability to lock to an axle shaft. They are ABEC bearings that can also be used in housing units and must have a cylindrical body to be pressed into a roller tube. Unlike other ABEC bearings they are available with hex bores and square bores.

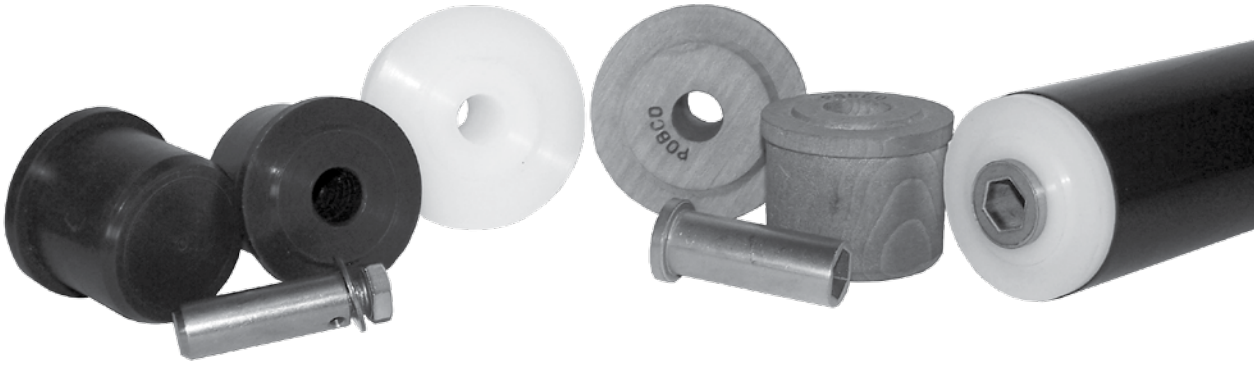
- Spherical Sleeved Bearings are large insert bearings with spherical bodies that must be fit into machined sleeves to be installed in roller tubes. The bearings can rotate within the sleeve which allows for more misalignment of the axle shaft.

- Plastic bearings have molded plastic bodies and stainless steel balls. Usually the bodies are Delrin, the balls are 420 stainless steel, and there is a ball retainer. They are used for highly corrosive environments and can be totally submerged. They do not require lubrication, due to the softness of the plastic, but have very limited load capacity.



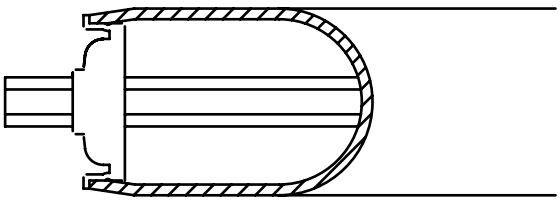
- Framesaver cartridges contain two radial ABEC bearings and a stub shaft in a polypropylene housing. The stub shaft is hex shaped, spring loaded, and slightly tapered to ensure a snug fit in the frame. This prevents the roller from bouncing in the frame and causing wear.

- Bushings (Roll End Bearings) are solid pieces of material with no rolling elements or moving parts. They fit directly into tubes and simply slide over the axle as they rotate. Depending on the material, they can be used for extreme temperatures, dirty environments, corrosive environments, or sanitary conditions. An adapter is required for use with hex axles. Blind bore versions can be used with stub shafts to make the roller water-tight.

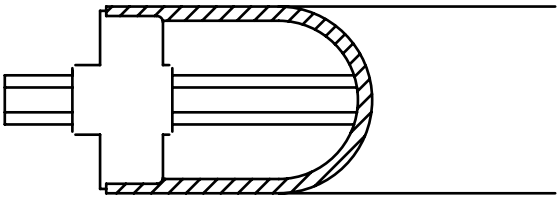


ROLLER ASSEMBLY

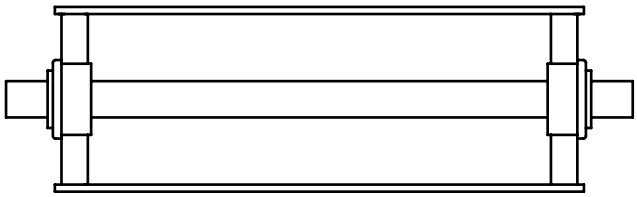
- A crimped roller has a tube which is crimped down over the bearing to hold it in place. Bearings installed in this manner are non-replaceable.



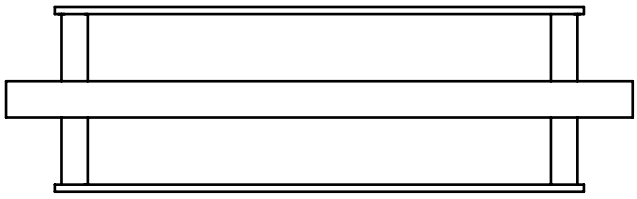
- A press fit roller has a tube which is counter bored to the correct inside diameter for the bearing to be press fit into place or slip fit for large diameter rollers.

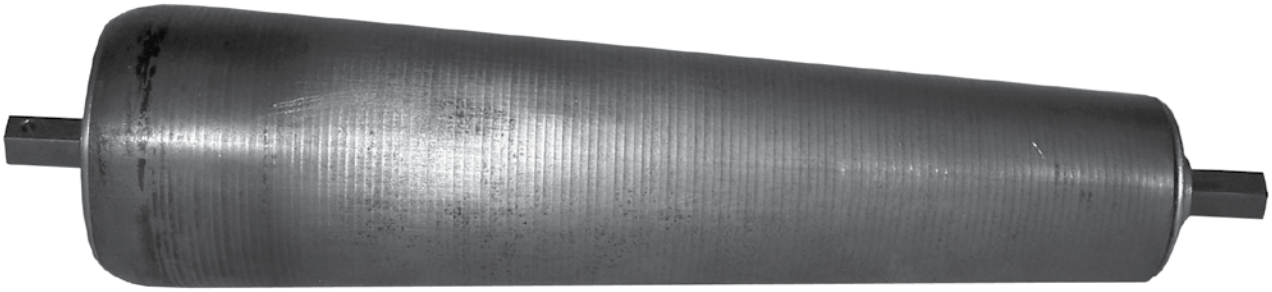


- A roller with bosses has steel slugs welded inside the ends of the tube. Bearings that are too small to fit into the tube can be press fit into the bosses. This allows for a wider variety of bearings to be used in the tube.

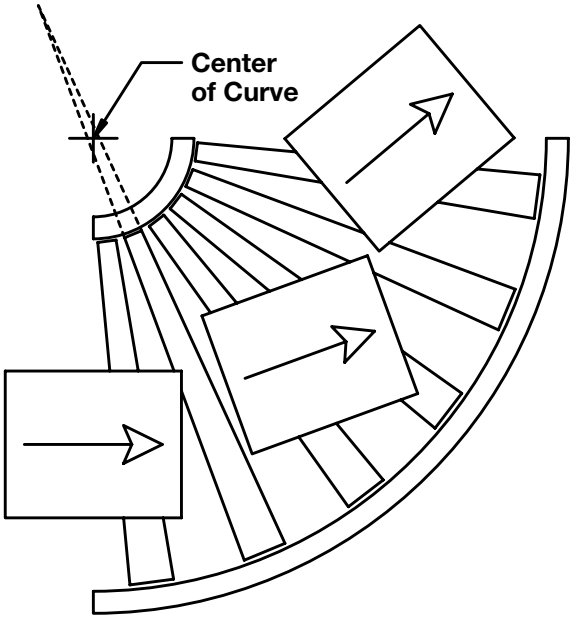


- Rollers with welded axles have bosses that are welded directly to the axle. These rollers do not use internal bearings. Instead the roller would be supported by externally mounted bearings.

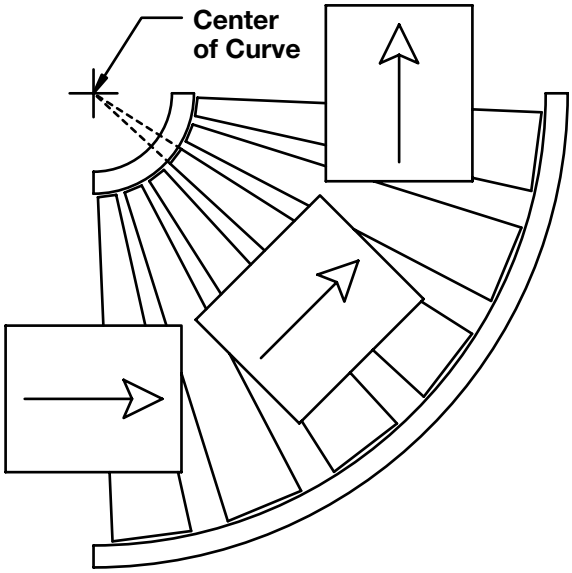




- Tapered rollers are specified by a large and small diameter.
- The angle that the diameter changes over a certain length is called the Taper Rate. (similar to the pitch of a roof)
- There are about a dozen taper rates that are standard throughout the industry.
- Omni has the ability to create a true taper based on the dimensions of the curve.
- Omni can create tapers with special taper rates as well as all industry standards.



- If the taper rate is not true for a given curve then the product will become skewed around the curve.

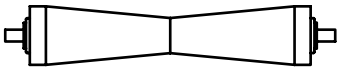


- When the taper rate is true for a given curve the product will maintain its orientation around the curve.

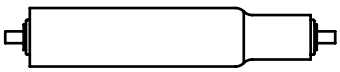
FORMED TUBES

- Tubes can be formed into many shapes for specific applications.
- Typically formed tubes are used to guide special products or to fit into special machinery.
- There are no standard formed tubes so each tube is custom built for the specific application.
- Some basic tube shapes include, but are not limited to: (right)

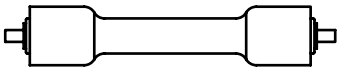
Concave Rollers



Bow-Tie Rollers



Turned-Down Rollers

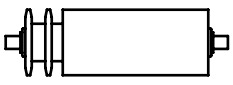


Dog-Bone Rollers

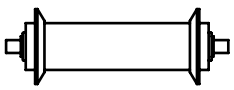
Bubble Roller

SPECIAL FEATURES

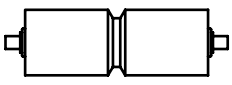
- Many different features can be welded onto or machined into a roller tube.
- Typically the features shown below have no standards and are custom built for each application.
- Some options include, but are not limited to:



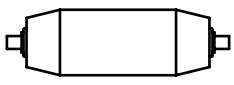
Sprocketed hubs allow the use of small sprockets with large tubes.



Flanges are welded to tubes to guide product.



V-groove hubs have different groove profiles for use with v-groove belts.



Trapezoidal Crowns are machined into tubes to assist in centering the drive belt.

Omni has the capability to manufacture rollers for almost any condition. Below are listed some common situations and the ways in which rollers are specialized to best handle these conditions. Keep in mind that a particular application may include several of the following scenarios.

Gravity Applications

Rollers are not directly driven and only rotate when product passes over them. For light products rollers are light-weight and bearings are lightly oiled to reduce rotational friction. Bearings may be grease packed for heavier products that can easily overcome rotational friction.

Powered Applications

Rollers are directly driven by belts, chains, or other means. Rollers may be rotating even when product is not present. Bearings are grease packed to maintain lubrication through more continuous use.

High Speeds

Rollers are subjected to operating speeds above 250 RPM. Rollers are built with light weight tubes that are straightened to tight tolerances to reduce imbalances and prevent bouncing. Bearings are semi-precision or precision for prolonged service life. When operating speeds exceed 400 RPM rollers are built using only precision bearings.

Heavy Loads

Rollers are subjected to large live loads during normal use. For small, light-duty rollers, a heavy load may be less than 100 lbs. For large, heavy-duty rollers, a heavy load may be more than 1000 lbs. Rollers are built with components that are large enough to resist deflection. At long BF's a center puck may be added to the axle to prevent the axle from deflecting too far and rubbing along the inside of the tube.

Stationary Loads

Rollers are subjected to long periods of being loaded but not rotating. Rollers are built with thicker tubes to prevent denting from prolonged loading on just one side of the tube. Bearings feature hardened raceways to resist denting and cages, or retainers, that keep the balls evenly spaced around the bearing to evenly distribute the load. Bushings may also be used due to their high static load capacities.

Impact Loads (Shock Loading)

Rollers are subjected to objects colliding with them. Products may have uneven bottoms that cause them to bounce along the rollers or products may be dropped or thrown while being loaded onto the rollers. Rollers are built with heavy walled tubes to resist denting. Bearings are high capacity to reduce the risk of damage. Bushings may be used due to their lack of moving (breakable) parts.

Dirty/Gritty Environment

Rollers are subjected to small particles of dirt or dust that can contaminate bearing lubrication and prevent the bearings from rotating. Bearings feature contact seals and shields that prevent particles from entering. Bearings may also be regreaseable so that lubrication can be regularly flushed. Bushings may also be used due to their lack of moving parts or need for lubrication.

Abrasive Products

Rollers are subjected to products that can scratch the tube surface and cause uneven wear to the tube. Products may have an abrasive bottom, the rollers may be spinning under a stationary product, or there may simply be dirt between the product and the rollers. Rollers are built with tubes that are heat treated to increase the tube surface hardness and resist scratching. Rollers may also be coated with different materials that are resistant to scratching.

Wash-down Conditions

Rollers are subjected to high pressure spray washes and possibly strong detergents. Rollers are built from materials that will not rust. Bearings feature seals that prevent lubrication from being washed away. Bushings may be used because they require no lubrication.

Corrosive Environment

Rollers are subjected to chemicals that promote corrosion. Rollers are built with materials that are resistant to corrosion from the specific chemicals involved. The rollers may be coated or plated with resistant materials for additional protection.

Low Temperature

Rollers are subjected to sub-zero ambient temperatures or product temperatures. Rollers are built with bearings containing low temperature grease or light oil that will not freeze and reduces start-up friction.

High Temperature

Rollers are subjected to ambient temperatures or product temperatures above 200°F. Rollers are built with thick walled tubes to dissipate heat and prevent warping. Bearings feature high temperature grease and have no rubber seals that can melt. Bushings may be used that are made from high temperature materials and require no lubrication.

QUESTIONS TO ASK

The more information that can be gathered from the customer about a roller the better Omni can help provide a roller that will meet the customer's needs. Below are some example questions that might be asked of the customer in order to help gather as much information as possible.

Is the roller being used in a conveyor?

What kind of conveyor is the roller being used in?

What is the product being conveyed?

What is the size of the product and how much does it weight?

How close together are the rollers in the conveyor?

How fast is the roller rotating?

How many hours per day is the roller being used?

NOTES