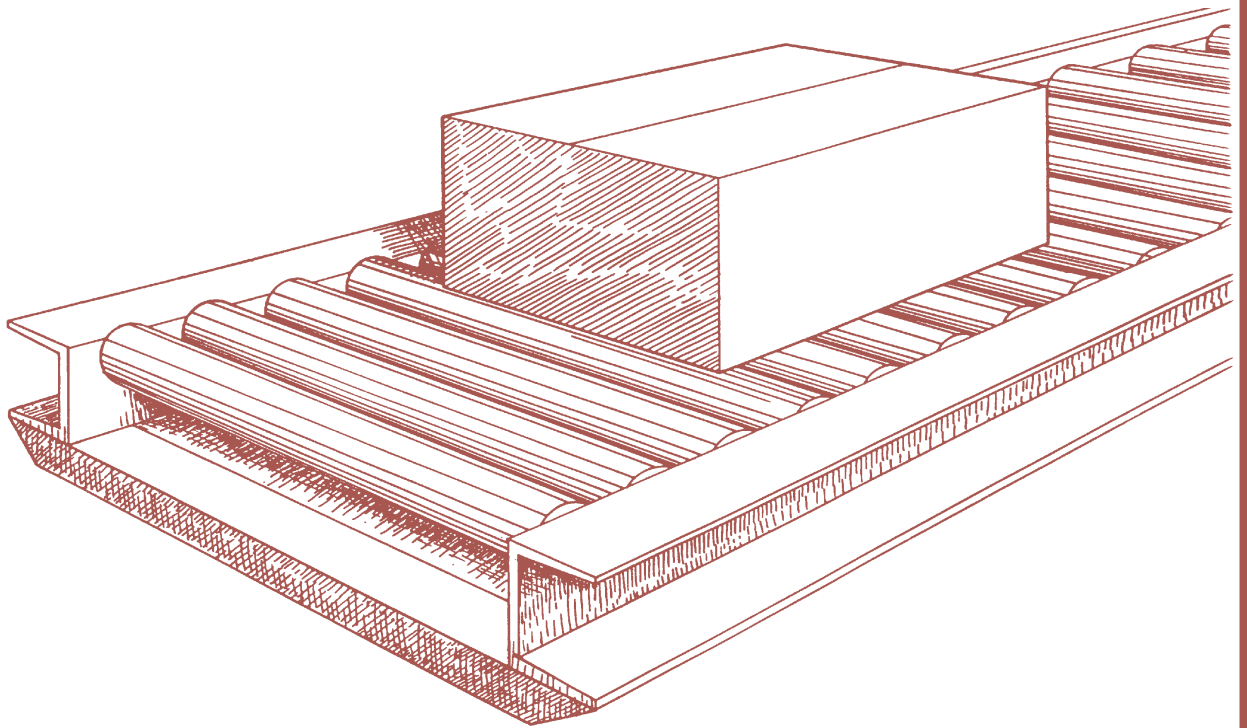


# CEMA STANDARD NO. 401- 2003



ANSI / CEMA 401-2003(R2009)  
Reaffirmation of ANSI/CEMA 401-2003  
( Approved January 22, 2009)

## ROLLER CONVEYORS - NON POWERED



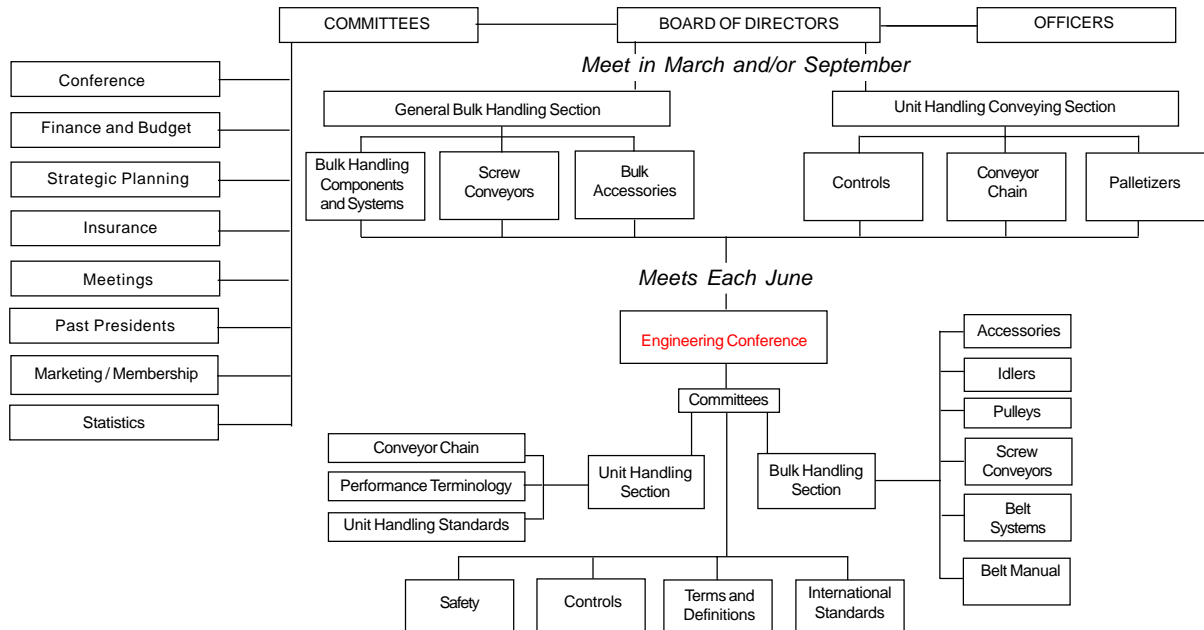
## Unit Handling Conveyors



Conveyor Equipment  
Manufacturers Association

ISBN 978-1-891171-23-9

## CEMA ORGANIZATIONAL CHART



For Information on Company Membership  
visit the CEMA Web Site at  
<http://www.cemanet.org>

### SAFETY NOTICE

The Conveyor Equipment Manufacturers Association has developed Industry Standard Safety Labels for use on the conveying equipment of its member companies.

The purpose of the labels is to identify common and uncommon hazards, conditions, and unsafe practices which can injure, or cause the death of, the unwary or inattentive person who is working at or around conveying equipment.

The labels are available for sale to member companies and non-member companies.

A full description of the labels, their purpose, and guidelines on where to place the labels on typical equipment, has been published in CEMA's *Safety Label Brochure* No. 201. The Brochure is available for purchase by members and non-members of the Association. Safety Labels and Safety Label Placement Guidelines, originally published in the Brochure, are also available free on the CEMA Web Site at [http://www.cemanet.org/CEMA\\_Safety\\_Pg.htm](http://www.cemanet.org/CEMA_Safety_Pg.htm)

**PLEASE NOTE:** Should any of the safety labels supplied by the equipment manufacturer become unreadable for any reason, the equipment USER is then responsible for replacement and location of these safety labels.

Replacement labels and placement guidelines can be obtained by contacting your equipment supplier or CEMA.

## FOREWORD

During the past century roller conveyors have developed from the original wooden rollers, with steel pins on the ends rotating in a frame, to the present day all metal construction with anti-friction bearings.

The first attempt to establish a standard method of evaluating the merits of the various sizes and designs being offered in the marketplace was the 1962 edition of CEMA Standard 401.

The purpose of this work is to establish certain minimum standards of comparison for use by concerns which specify, manufacture, and use non-powered roller conveyors.

For additional information relating to definitions and selection of common components, see the latest edition of the following publications: CEMA Standard No. 102, *Conveyor Terms and Definitions*; CEMA Standard No. 402, *Belt Conveyors*; CEMA Standard No. 403, *Belt Driven Live Roller Conveyors*; CEMA Standard No. 404, *Chain Driven Live Roller Conveyors*; CEMA Standard No. 405, *Slat Conveyors*; and CEMA Standard No. 406, *Lineshaft Driven Live Roller Conveyors*.

The illustrations throughout this book are schematic in nature and represent the general nature of a particular device. The illustrations are not intended to represent the recommended safety configurations since guarding has been omitted to permit clarity in showing the operational characteristics of the device. Refer to the current editions of ANSI/ASME B20.1, *Safety Standard for Conveyors and Related Equipment*; ANSI/ASME B15.1, *Safety Standard for Mechanical Power Transmission Apparatus*; and ANSI Z244.1, *American National Safety Standards for Lockout/Tagout of Energy Sources - Minimum Safety Requirements*; Title 29, Code of Federal Regulations (29 C.F.R.) Part 1910.147, *The Control of Hazardous Energy (lockout/tagout)*; Title 29, Code of Federal Regulations (29 C.F.R.) Part 1910 Subpart O, *Machinery and Machine Guarding*. Consult ASME or ANSI for the latest editions.

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### CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION

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**Note - CEMA Has Reaffirmed the 2003 Edition.  
This 2009 Edition is Identical to the 2003 Edition**

**SUMMARY OF CHANGES IN 2003 EDITION**

- All drawings have been cleaned up and enhanced for clarity where necessary.
- Foreword has been updated to include new Safety References.
- A Safety Notice regarding Industry Standard Safety Labels has been added.
- Terms and Definitions have been edited to conform with those in ANSI/CEMA 102 “Conveyor Terms and Definitions”.
- All Figures and charts have been redrawn and, in some cases, modified for clarity

**CEMA Standard No. 401-2003 (R2009)  
Reviewed by  
Unit Handling Section  
of the  
CEMA Engineering Conference**

## Section 1

### DEFINITIONS

For general definitions see also CEMA Publication 102, Conveyor Terms and Definitions. *Italics indicate definitions or wording unique to this document.*

**Axle** - A shaft, either rotating or non-rotating, on which are mounted drive, driven, or supporting wheels or rollers.

**Bearing** - A machine part in or on which a journal, shaft, axle, pin or other part rotates, oscillates or slides.

**Coupling** - A member used to join conveyor sections to make an integral conveyor.

**Cross Ties** - Structural members which maintain frame rail spacing on unit handling conveyors.

**Frame Rails** - Members which support the conveying component of powered and non powered conveyors.

**Grade** - The rate of incline or decline in terms of degrees from the horizontal; percent of rise to the horizontal distance; or inches of vertical rise per foot of horizontal projection.

**Rated Life of Bearings** - *Manufacturer's ratings based on load speed factors. See Page 7.*

**Roller** - A round part free to revolve its outer surface. The face may be straight or tapered, covered, concave or flanged, corrugated, ribbed or fluted. Rollers may have live axle or dead axle construction.

**Roller Centers** - Distance between centerlines of adjacent rollers. For curves, roller centers are measured at the inside radius.

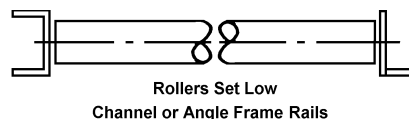
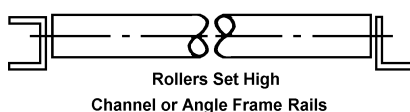
**Roller Conveyors** - A series of rollers supported in a frame over which objects are advanced manually, by gravity, or by power.

**Roller Conveyor Curve** - A circular section of roller conveyor. *The curve radius is measured to the inside face of the inside frame rail. The hand of a curve is determined when facing in the direction of travel (see Figure 1, Page 2).*

Curves may have either:

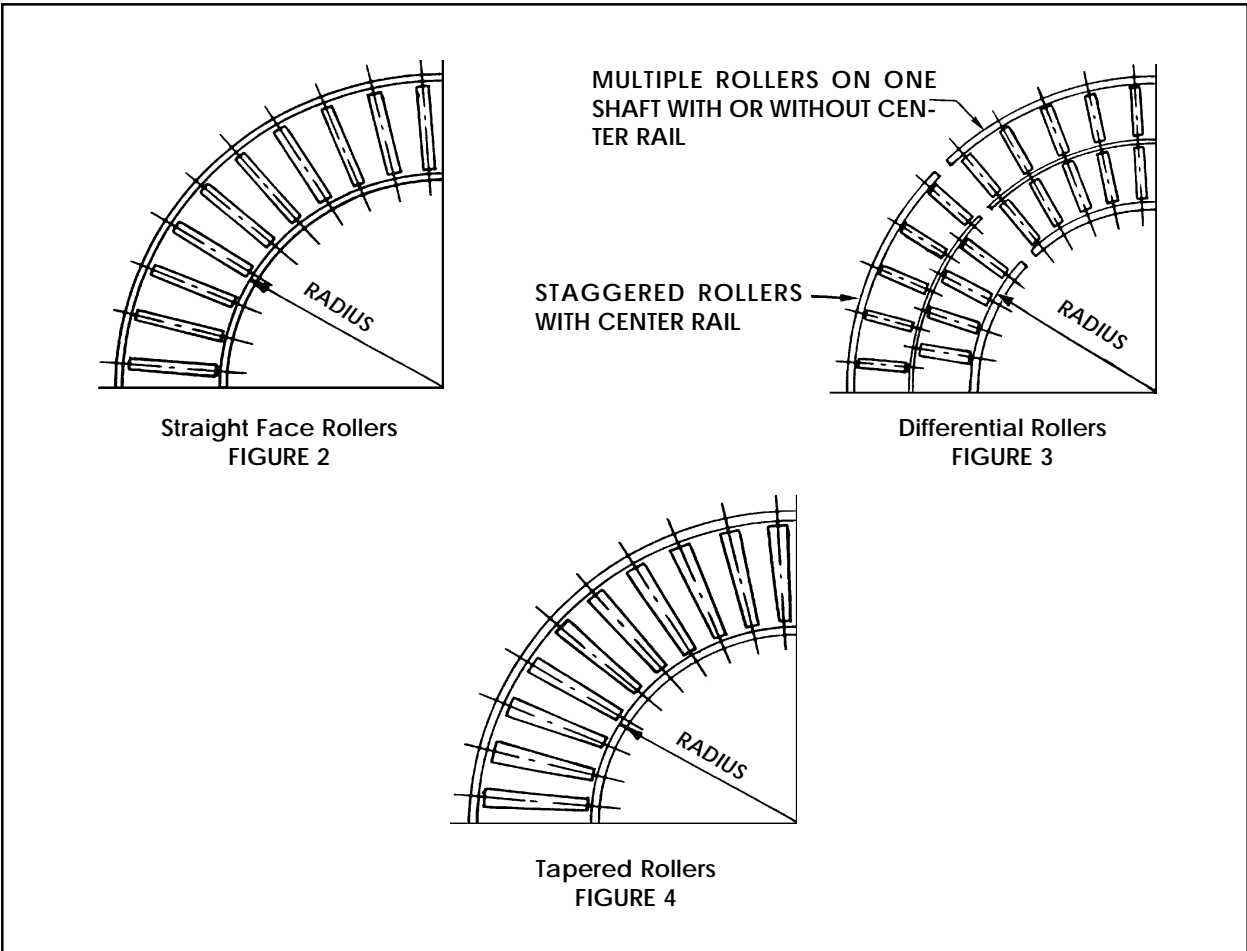
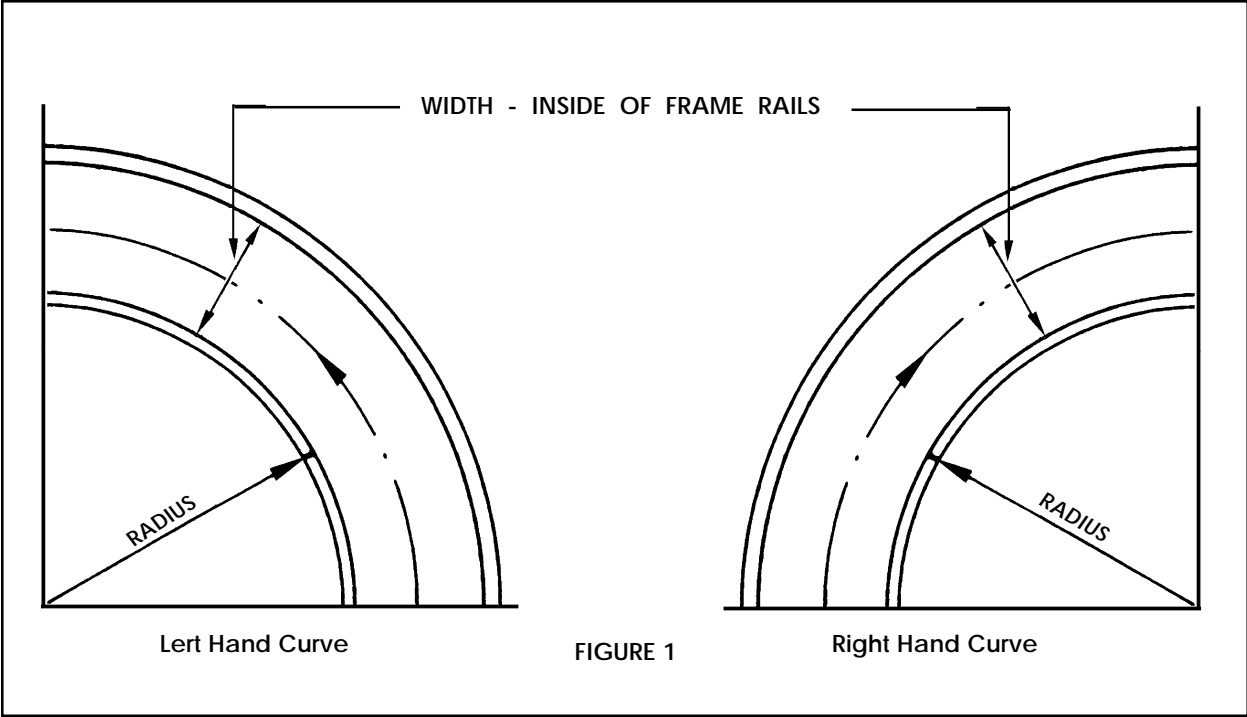
- A. Straight face rollers (see Figure 2, Page 2)
- B. Differential rollers (see Figure 3, Page 2)
- C. Tapered rollers (see Figure 4, Page 2)

**Straight Section** - *An assembly of frame rails, cross-tie members and rollers. Rollers may be set high or low in frame rails (see below).*



**Supports** - Arrangement of members used to maintain the elevation or alignment of the conveyor. Supports can take the form of hangers, floor supports, or brackets and can be either stationary or portable.

**Width** - *The dimension inside to inside of the conveyor frame rails.*



## Section 2

### APPLICATION

#### **Use of Roller Conveyors**

Roller conveyors are widely used in unit handling systems because of their simplicity, economy, and ease of maintenance. Application is in the form of level pushlines or graded lines utilizing the natural force of gravity.

#### **Conveyability**

Unit loads conveyed on roller conveyors may vary extensively in weight, size, and surface condition. The weight is restricted only by the strength of the conveyor components and the ability to move and stop the unit load.

The factors that limit the use of roller conveyors are generally related to the specific requirements of handling the unit load and the site conditions.

A unit load is generally conveyable if the surface that is resting on the conveyor is smooth, firm, and long enough to span over three or more rollers. Characteristics and application limitations are significant factors to be considered in roller conveyor selection.

Some examples of limitations are:

- A. Cartons containing relatively fragile products will require analysis of the degree of gravity flow that can be utilized.
- B. Unit loads that are in process of manufacture and may be subject to damage if they impact against a preceding unit load may eliminate the use of gravity or limit the application to level lines. Such unit loads could be fragile electronic equipment or heavy parts with finished machined surfaces.
- C. Heavy unit loads, such as palletized items, cannot usually be conveyed long distances by gravity flow unless speed control devices are utilized.
- D. Functions such as in-process assembly, packing, testing, and order picking are usually performed on level roller conveyors. However, limited use of gravity flow may be utilized to provide accumulation.

#### **System Layout**

Roller conveyors are usually employed as part of a system. Some factors affecting system layout are as follows:

- A. Unit load data and selection of conveyor width.  
Dimensional data is used to establish the basic width of a system, radius of curves, and arrangement of conveyor merge points. Note that width requirements of curves generally establish system width. (See Figure 5, Page 4.)
- B. Use of gravity flow lines.  
The critical points of elevation must be established and care exercised in determining the correct grade requirements. Note that curve sections require more grade than straight sections. The layout is developed to show the various elevations as related to the site and requirements for additional equipment established.
- C. Stoppages on gravity flow lines  
Gravity flow lines are subject to stoppages due to unit load jamming or guide rail friction. Access must be provided to permit personnel to clear stoppages.

#### **Component Specification**

The general specifications for roller conveyors usually include the following, in order of importance: