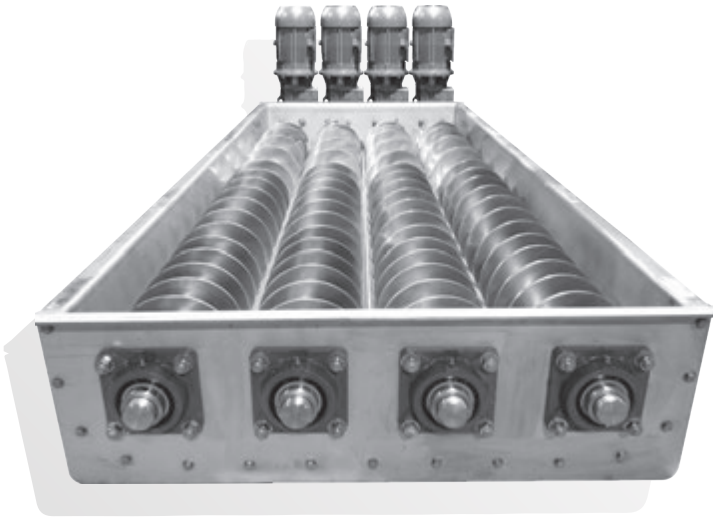
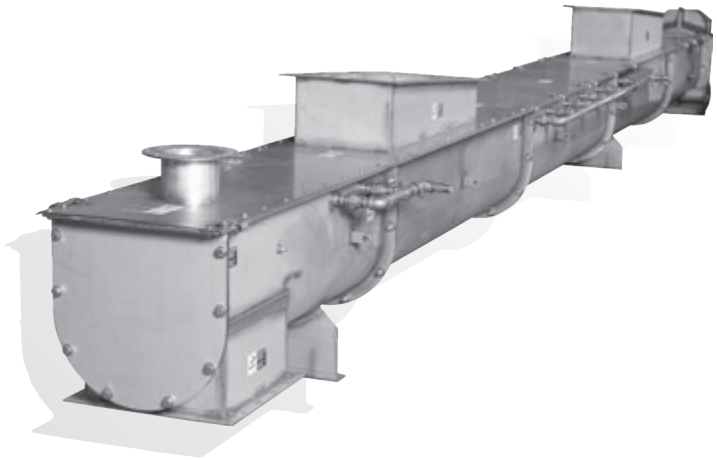
thomas® conveyor company





SCREW CONVEYOR

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

INSTALLATION
OPERATION
MAINTENANCE
INSTRUCTIONS

Safety must be considered a basic factor in machinery operation at all times. **Most accidents are the results of carelessness or negligence.** All rotating power transmission products are potentially dangerous and must be guarded by the contractor, installer, purchaser, owner, and user as required by applicable laws, regulations, standards, and good safety practice. Additional specific information must be obtained from other sources including the latest editions of American Society of Mechanical Engineers; Standard A.N.S.I. B15.1. A copy of this standard may be obtained from the American Society of Mechanical Engineers at 345 East 47th Street New York, NY 10017 (212705-7722).

It is the responsibility of the contractor, installer, purchaser, owner, and user to install, maintain, and operate the parts or components manufactured and supplied by Thomas Conveyor Company, in such a manner as to comply with the Williams-Steiger Occupational Safety Act and with all state and local laws, ordinances, regulations, and the American National Standard Institute Safety Code.

Caution

All OSHA Lock Out/Tag Out procedures are to be properly followed prior to removal of any guards, access doors or covers for inspection or general maintenance. Failure to follow these instructions may result in severe personal injury and/or property damage.

Warning: Static Electricity

Static Electricity may accumulate on modular plastic conveyor screws which carry non-conductive materials and may produce an electrical spark. **Do Not Use to Convey Non-Conductive Materials in a Combustible Environment.**

Notice

Troubleshooting guidelines are to be used as a general rule of thumb to fix common problems associated with power transmission and material handling equipment using Thomas products. These guidelines are in no way intended to replace, supersede or override equipment manufacturer's installation and operating guides. Thomas publishes this information to be used by trained professionals. There is no warranty or guarantee either expressed or implied with respect to the troubleshooting guidelines. In no event shall Thomas be held liable for any damage to equipment arising from the use of these guidelines, or failure to follow the equipment manufacturer's installation and operating guide. **The safety reminder and cautionary note is not meant to be a comprehensive analysis of all potential safety hazards, and is provided solely to call your attention to general safety concerns when operating power transmission and material handling equipment. Thomas accepts no responsibility for any failure to follow the safety recommendations noted above.** For specific troubleshooting recommendations concerning any product Thomas sells, please contact Thomas.

CEMA Document: SC 2018-01
Revision of SC 2004-01
Approved: March 2018

WARNING AND SAFETY REMINDERS FOR SCREW, DRAG, AND BUCKET ELEVATOR CONVEYORS

Approved for Distribution by the Joint Screw Conveyor and Bucket Elevator Section of the Conveyor Equipment Manufacturers Association (CEMA)

It is the responsibility of the contractor, installer, owner, and user to install, maintain and operate the conveyor, components, and conveyor assemblies in such a manner as to comply with the Occupational Safety and Health Act and with all state and local laws and ordinances and the American National Standards Institute (ANSI) B20.1 Safety Code.

Paragraph 5.16 of ANSI B20.1 addresses risk assessment and risk reduction. Risk assessment and risk reduction should be performed by the owner and user at each phase of a conveyor or conveyor system's life cycle. Examples of risk assessment processes can be found in the following:

1. CEMA Technical Report 2015-01
2. ANSI/ASSE Z590.3 (American Society of Safety Engineers)
3. MIL-STD-882 (U.S. Military Standard)

In order to avoid an unsafe or hazardous condition, the assemblies or parts must be installed and operated in accordance with the following minimum provisions.

1. Conveyors shall not be operated unless all covers and/or guards for the conveyor and drive unit are in place. If the conveyor is to be opened for inspection cleaning, maintenance, or observation, the electric power to the motor driving the conveyor must be LOCKED OUT in such a manner that the conveyor cannot be restarted by anyone; however remote from the area, until conveyor cover or guards and drive guards have been properly replaced.

2. If the conveyor must have an open housing as a condition of its use and application, the entire conveyor is then to be guarded by a railing or fence in accordance with ANSI standard B20.1.(Request current edition and addenda)

3. Feed openings for the shovel, front loaders, or other manual or mechanical equipment shall be constructed in such a way that the conveyor opening is covered by a grating. If the nature of the material is such that a grating cannot be used, then the exposed section of the conveyor is to be guarded by a railing or fence and there shall be a warning sign posted.
4. Do not attempt any maintenance or repairs of the conveyor until power has been LOCKED OUT.

5. Always operate the conveyor in accordance with these instructions and those contained on the caution labels affixed to the equipment.

6. Do not place hands, feet, or any part of your body, in the conveyor.

7. Never walk on conveyor covers, grating, or guards.

8. Do not use the conveyor for any purpose other than that for which it was intended.

9. Do not poke or prod material into the conveyor with a bar or stick inserted through the openings.

10. Keep the area around the conveyor drive and control station free of debris and obstacles.

11. Eliminate all sources of stored energy (materials or devices that could cause conveyor components to move without power applied) before opening the conveyor.

12. Do not attempt to clear a jammed conveyor until power has been LOCKED OUT.

13. Do not attempt field modification of the conveyor or components.

14. Conveyors are not normally manufactured or designed to handle materials that are hazardous to personnel. These materials which are hazardous include those that are explosive, flammable, toxic, or otherwise dangerous to personnel. Conveyors may be designed to handle these materials. Conveyors are not manufactured or designed to comply with local, state, or federal codes for unfired pressure vessels. If hazardous materials are to be conveyed or if the conveyor is to be subjected to internal or external pressure, the manufacturer should be consulted prior to any modifications.

CEMA insists that disconnecting and locking out the power to the motor driving the unit provides the only real protection against injury. Secondary safety devices are available; however, the decision as to their need and the type required must be made by the owner-assembler as we have no information regarding plant wiring, plant environment, the interlocking of the screw conveyor with other equipment, the extent of plant automation, etc. Other devices should not be used as a substitute for locking out the power prior to removing guards or covers. We caution that the use of the secondary devices may cause employees to develop a false sense of security and fail to lock out power before removing covers or guards. This could result in a serious injury should the secondary device fail or malfunction.

There are many kinds of electrical devices for interlocking of conveyors and conveyor systems such that if one conveyor in a system or process is stopped other equipment feeding it, or following it can also be automatically stopped.

Electrical controls, machinery guards, railings, walkways, arrangement of installation, training of personnel, etc., are necessary ingredients for a safe working place. It is the responsibility of the contractor, installer, owner, and user to supplement the materials and services furnished with these necessary items to make the conveyor installation comply with the law and accepted standards.

Conveyor inlet and discharge openings are designed to connect to other equipment or machinery so that the flow of material into and out of the conveyor is completely enclosed.

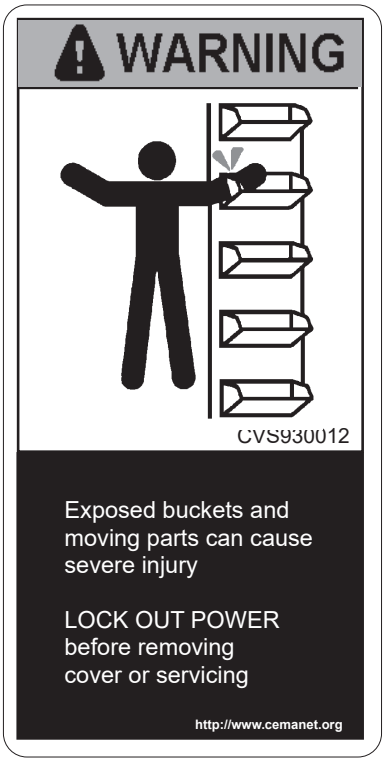
One or more warning labels should be visible on conveyor housings, conveyor covers, and elevator housings. If the labels attached to the equipment become illegible, please order replacement warning labels from the OEM or CEMA.

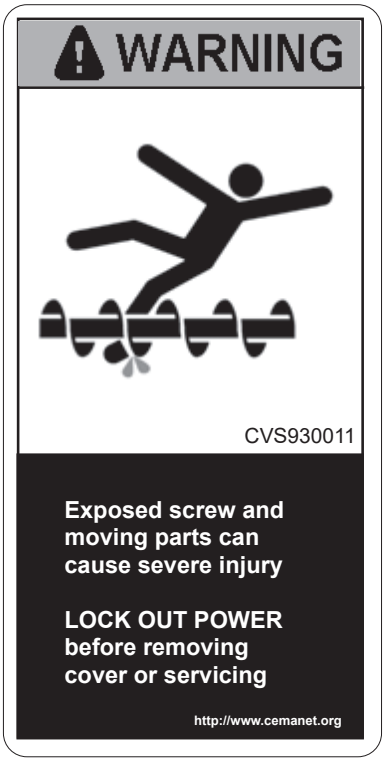
CEMA has produced a video presentation entitled "Screw Conveyor, Drag Conveyor, and Bucket Elevator Safety Video", and encourages the acquisition and use of this source of safety information to supplement your safety program.

SEE NEXT PAGE FOR SAFETY LABELS

CEMA Safety Labels

The CEMA safety labels shown below should be used on screw conveyors, drag conveyors, and bucket elevators. Safety labels should be placed on inlets, discharges, troughs, covers, inspection doors & drive guards. See CEMA Safety Label Placement Guidelines on CEMA's Website: www.cemanet.org





PROMINENTLY DISPLAY THESE SAFETY LABELS ON INSTALLED EQUIPMENT

(SEE PREVIOUS PAGE FOR SAFETY REMINDERS)

***Note*: Labels alone do not substitute for a thorough in-plant safety training program centered on the hazards associated with operating your installed equipment.**

Contact CEMA or Your Equipment Manufacturer for Replacement Labels

CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION, INC. (CEMA)

THESE CEMA SAFETY LABELS CAN HELP MAKE YOUR CONVEYING EQUIPMENT OPERATIONS SAFER

CHR930001
CHS930001
(5"Wide x 2 1/2" High)

CHR930006
(5"Wide x 2 1/2" High)

CHR930011
(5"Wide x 2 1/2" High)

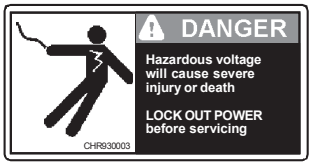
CHS950017
(5" Wide x 2 1/2" High)

CHR930002
(5"Wide x 2 1/2" High)

CHR930007
(5"Wide x 2 1/2" High)

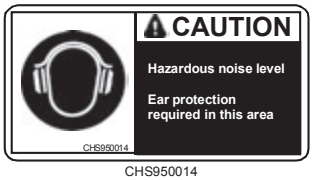
CHS950013
(5"Wide x 2 1/2" High)

CHS950018
(5"Wide x 2 1/2" High)

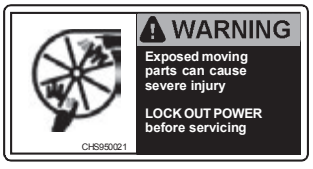


CHR930003
(5" Wide x 2 1/2" High)

CHR930008
(5"Wide x 2 1/2" High)

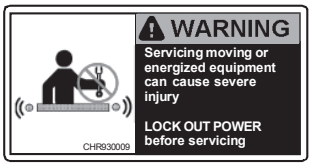


CHS950014
(5"Wide x 2 1/2" High)

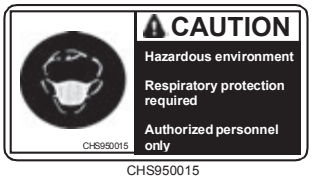


CHS950021
(5"Wide x 2 1/2" High)

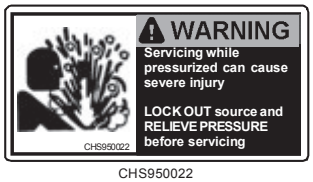
CHR930004
(5" Wide x 2 1/2" High)



CHR930009
(5"Wide x 2 1/2" High)



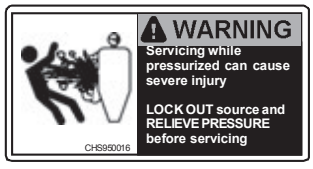
CHS950015
(5"Wide x 2 1/2" High)



CHS950022
(5"Wide x 2 1/2" High)

CHR931005
(5"Wide x 2 1/2" High)

CHR930010
(5"Wide x 2 1/2" High)

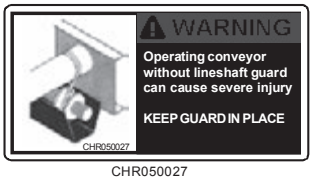


CHS950016
(5"Wide x 2 1/2" High)

CHR951023
(5"Wide x 2 1/2" High)

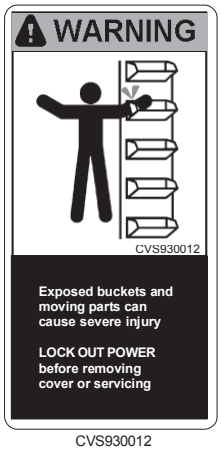
CHR000025
(5"Wide x 2 1/2" High)

CHS991026
(5"Wide x 2 1/2" High)



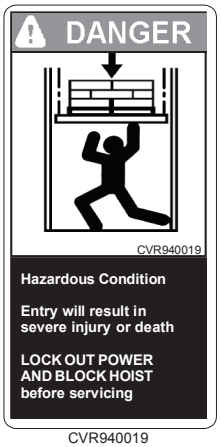
CHR050027
(5"Wide x 2 1/2" High)

CVS930010
(3" Wide x 6" High)



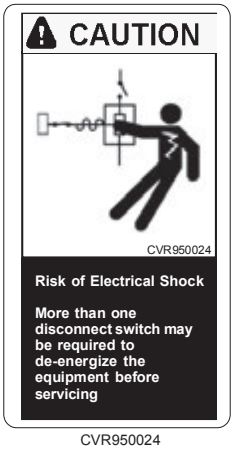
CVS930012
(3" Wide x 6" High)

CVS930011
(3" Wide x 6" High)



CVR940019
(3" Wide x 6" High)

CVS950020
(3" Wide x 6" High)



CVR950024
(3" Wide x 6" High)

As Of August 1, 2005

Recommended Spares

MATERIAL HANDLING EQUIPMENT	STARTUP SPARES *	OPERATING SPARES **
Screw conveyor **Shaftless screw conveyor** **Vertical screw elevator**	Hanger bearings Coupling shafts Coupling bolts End shaft End seal End bearing Drive belts or chain	Screws Drive shaft Hanger frames Gaskets Shroud covers Covers (if desired)
Bucket elevator	Belt carrier line Mechanical belt splice Chain carrier line Buckets Bucket fasteners Head bearings Head shaft seals Boot bearings Boot shaft seals Drive belts or chain	Head sprocket Head pulley & bushings Boot sprocket Boot pulley & bushings
Drag conveyor	Chain carrier line Drag flights Drag flight backing plates Drag flight fasteners Head bearings Head shaft seals Boot bearings Boot shaft seals Drive belts or chain	Head sprocket Boot sprocket
Belt conveyor	Troughing idlers Return idlers Belt carrier line Belt clamp Head bearings Head shaft seals Tail bearings Tail shaft seals Drive belts or chain	Head pulley & bushings Snub pulley & bushings Bend pulleys & bushings Take-up pulley & bushings Tail pulley & bushings Impact bed

* Startup spares are recommended from the day of installation & commissioning, for immediate & urgent need.
** Operating spares are recommended after a period of operation, for replacement during scheduled maintenance.

General Bolt Tightening Torque

Thread Size	Tensile Stress Area	SAE Grade 2		SAE Grade 5		SAE Grade 8	
		75% Yield Strength (PSI) - 43000		75% Yield Strength (PSI) - 69000		75% Yield Strength (PSI) = 98000	
	TSA	Plain	Zinc Plated	Plain	Zinc Plated	Plain	Zinc Plated
	Square Inches	Ft.Lb.	Ft.Lb.	Ft.Lb.	Ft.Lb.	Ft.Lb.	Ft.Lb.
1/4-20.	0.0318	6	6	9	10	13	14
1/4-28.	0.0364	7	7	10	12	15	16
5/16-18.	0.0524	12	13	19	21	27	29
5/16-24.	0.058	13	14	21	23	30	33
3/8-16.	0.0775	21	23	33	37	47	52
3/8-24.	0.0878	24	26	38	42	54	59
7/16-14.	0.1063	33	37	53	59	76	83
7/16-24.	0.1187	37	41	60	66	85	93
1/2-13.	0.1419	51	56	82	90	116	127
1/2-20.	0.1599	57	63	92	101	131	144
9/16-12.	0.182	73	81	118	129	167	184
9/16-18.	0.203	82	90	131	144	186	205
5/8-11.	0.226	101	111	162	179	231	254
5/8-14.	0.256	115	126	184	202	261	287
3/4-10.	0.334	180	197	288	317	409	450
3/4-16.	0.373	200	221	322	354	457	503

The reason all applications should be evaluated to determine the optimum tightening torque is that the K factor in this formula is always an estimate.

The most commonly used bolting K factors arc 0.20 for plain finished bolts, 0.22 for zinc plated bolts, and 0.10 for waxed or highly lubricated bolts

Formula: **T**= **K** × **D** × **P**

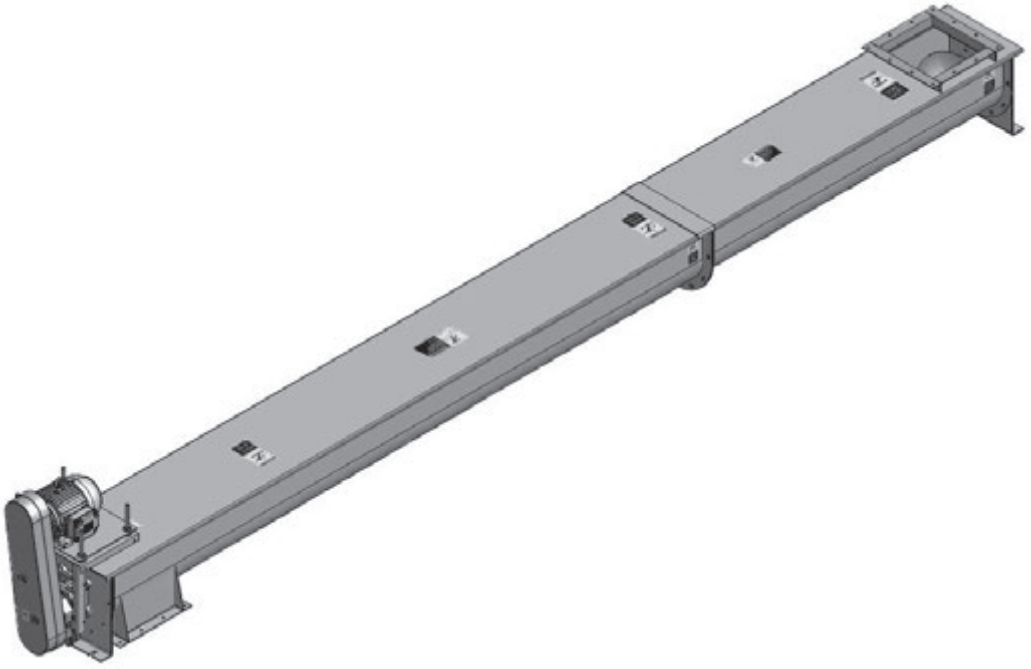
- **T** Target tighten torque (the result of this formula is in inch pounds, dividing by 12 yields foot pounds
- **K** Coefficient of friction (nut factor), always an estimation in this formula
- **D** Bolts nominal diameter in inches
- **P** Bolt's desired tensile load in pounds (generally 75% of yield strength) - [P(lbs) = (75%) Yield Strength * Tensile Stress Area]

CEMA No. 352 - 2018
Revision of CEMA No. 352 - 2012
Approved: March 2018

CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION

CEMA No. 352

Screw Conveyor Safety, Operation, and Maintenance Manual



Conveyor Equipment Manufacturers Association, Inc.

DISCLAIMER

The information provided herein is advisory only.

These recommendations provided by CEMA are general in nature and are not intended as a substitute for professional advice. Users should seek the advice, supervision and/or consultation of qualified engineers, safety consultants, and other qualified professionals.

Any use of this publication, or any information contained herein, or any other CEMA publication is made with the agreement and understanding that the user and the user's company assume full responsibility for the designs, safety, specifications, suitability and adequacy of any conveyor system, system component, mechanical or electrical device designed or manufactured using this information.

The user and the user's company understand and agree that CEMA, its member companies, its officers, agents and employees are not and shall not be liable in any manner under any theory of liability to anyone for reliance on or use of these recommendations. The user and the user's companies agree to release, hold harmless and indemnify and defend CEMA, its member companies, successors, assigns, officers, agents and employees from any and all claims of liability, costs, fees (including attorney's fees), or damages arising in any way out of the use of this information.

CEMA and its member companies, successors, assigns, officers, agents and employees make no representations or warranties whatsoever, either expressed or implied, about the information contained herein, including, but not limited to, representations or warranties that the information and recommendations contained herein conform to any federal, state or local laws, regulations, guidelines or ordinances.

ISBN 1-891171-91-8

Conveyor Equipment Manufacturers Association, Inc. (CEMA)
1250 Tamiami Trail N, Suite 211
Naples, Florida 34102
www.cemanet.org

INTRODUCTION

The CEMA *Screw Conveyor Committee* was assigned the task of bringing together, under one cover, the accumulated experience of many individuals and their companies in an effort to provide a common basis for the safety, operation and maintenance of screw conveyors.

The **Screw Conveyor Safety, Operation, and Maintenance Manual** contains instructions for the safe installation, operation and maintenance of screw conveyors. The reliability and service life depend on the proper care taken while installing and preparing the equipment for its intended use.

Read **ALL** instructions in this manual and manufacturer's manuals **BEFORE** installing, operating and maintaining the equipment.

TABLE OF CONTENTS

SECTION A - SAFETY

Screw conveyor safety begins with a plan that considers every possible danger and potential hazard. Operation and maintenance personnel must be thoroughly trained in safe operating procedures, recognition of possible hazards, and maintenance of a safe area around screw conveyors.

CEMA has a comprehensive safety program that includes:

- CEMA Technical Document SC 2018-01: Warning and Safety Reminder for Screw, Drag, and Bucket Elevators Conveyors
- CEMA Brochure No. 201: Safety Label Brochure
- CEMA Safety Label Placement Guidelines by Product:
  - Screw Conveyors (CEMA Document: SC-2)
  - Vertical Screw Conveyors (CEMA Document: SC-3)
- CEMA Screw Conveyor Safety Poster
- CEMA A/V No. 6: Screw Conveyor, Drag Conveyor and Bucket Elevator Safety DVD - This DVD describes key safety practices that personnel must follow when operating and maintaining screw conveyors, drag conveyors and bucket elevators

Screw conveyor accidents can be avoided by implementation and enforcement of an in-plant safety program. A number of safety precautions are included in this manual. Carefully study and follow the safety precautions.

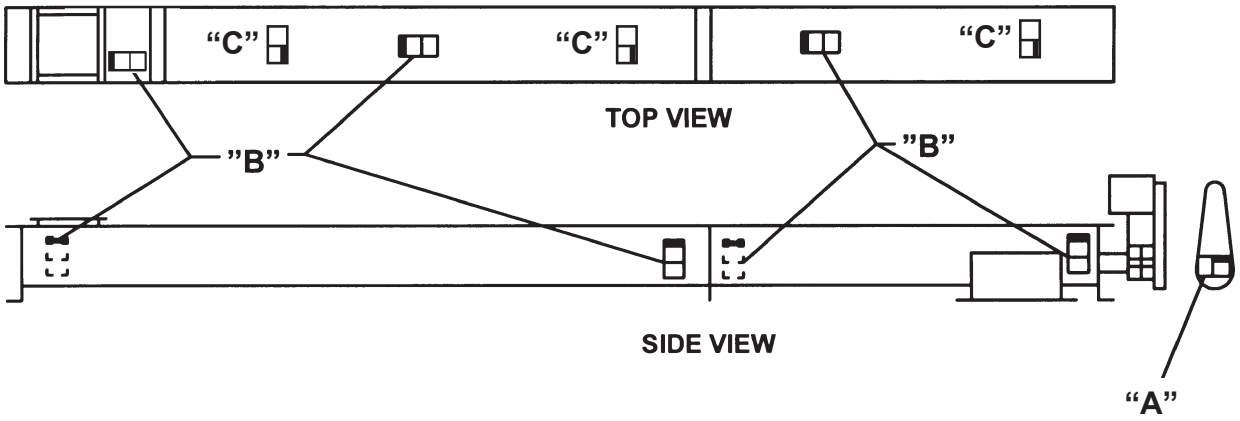
Remember

Accidents are usually caused by negligence or carelessness.

CEMA Safety Labels Placement Guidelines

Product: Bulk Handling Equipment

Equipment: Screw Conveyors (**SC-2**)



NEAR SIDE

FAR SIDE

Use Label "A" on belt guard.
Use Label "B" on ends of trough, middle of covers, and at inlet opening.
Use Label "C on top of covers.

"A"

To be placed on removable guards to warn that operation of the machinery with guards removed would expose chains, belts, gears, shafts, pulleys, couplings, etc. which create hazards.

"C"

To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation

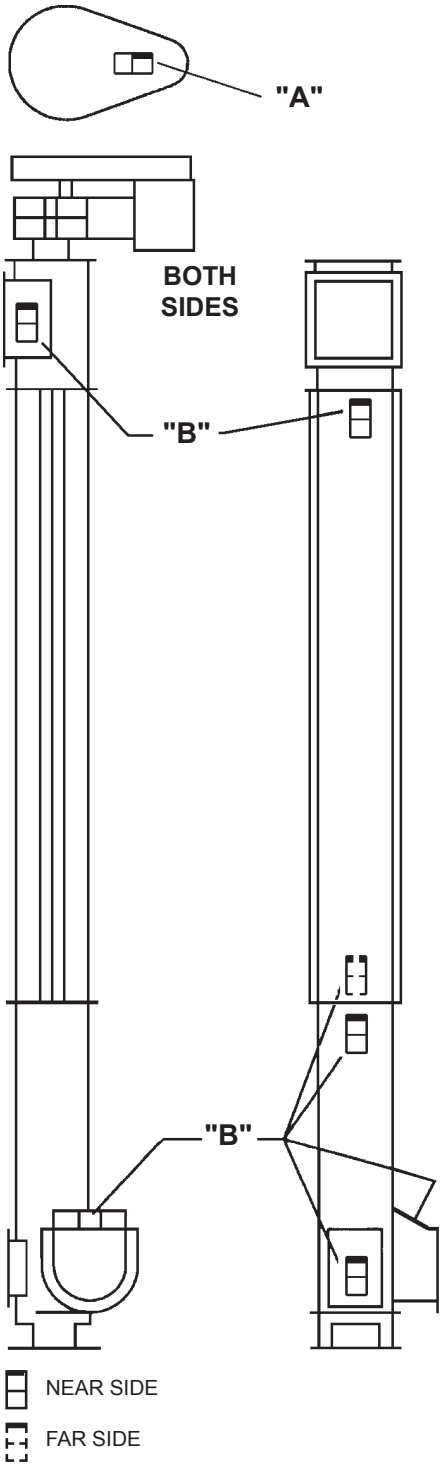
"B"

To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation

CEMA Safety Labels Placement Guidelines

Product: Bulk Handling Equipment

Equipment: Vertical Screw Conveyors (**SC-3**)



Use Label “A” on belt guard.
Use Label “B” on ends of trough, on intake inspection door, and both sides of discharge spout.

“A”

To be placed on removable guards to warn that operation of the machinery with guards removed would expose chains, belts, gears, shafts, pulleys, couplings, etc. which create hazards.

“B”

To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation

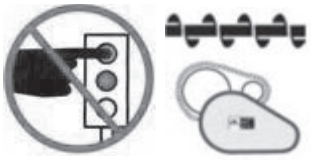
CEMA Screw Conveyor Safety Poster

CEMA
CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION

Screw Conveyors

Do not climb, sit, stand,or walk on the conveyor at any time.

Do not perform maintenance on conveyor until electrical, air, hydraulic, and gravity energy sources have been locked out and blocked.



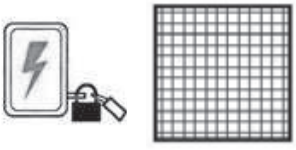
Operate equipment only with all approved covers and guards in place.

LOCK OUT ALL power and block gravity loads before servicing.

Ensure that all personnel are clear of equipment before starting.

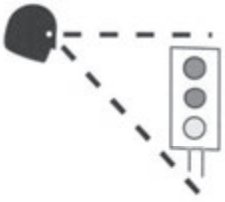
Allow only authorized personnel to operate or maintain material handling equipment.

Keep clothing, body parts, and hair away from conveyors.

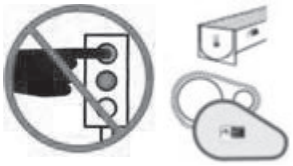


Clean up spillage near moving parts ONLY when the power is locked out AND guards are in place.

Do NOT modify conveyor controls.



Ensure that ALL controls are visible and accessible.

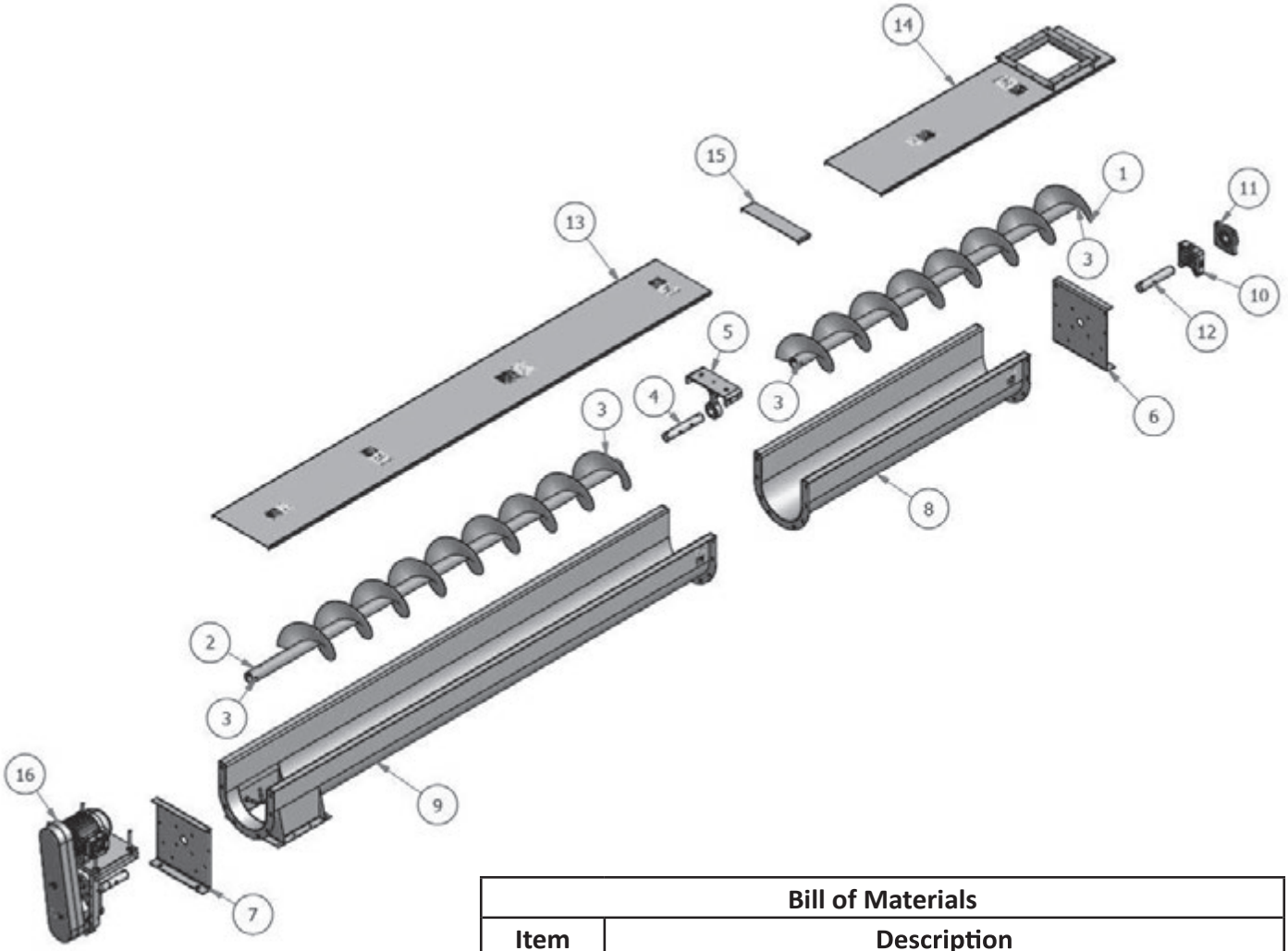


Operate equipment only with all approved covers, guards, and safety labels in place.

Report all unsafe conditions.

POST IN PROMINENT AREA

Screw Conveyor Components



Bill of Materials	
Item	**Description**
1	Screw
2	Screw with Bare Pipe at Discharge
3	Coupling Bolts (Not Shown)
4	Coupling Shaft
5	Hanger with Bearing
6	Tail End Trough End
7	Conveyor Trough With Discharge Spout
8	Conveyor Trough
9	Trough with Discharge Spout
10	Seal
11	Bearing
12	Tail Shaft
13	Flanged Cover
14	Flanged Cover with Inlet
15	Buttstrap
16	Screw Conveyor Drive Unit with Motor Mount, V-Belt

SECTION B - INSTALLATION

Receiving

1. Screw conveyors may be ordered as individual components with all the assembly operations performed in the field, or assembled completely by the manufacturer, with drawings and bill of materials.
2. Immediately upon receipt all items in the shipment should be checked against shipping papers for shortages and inspected for damage.
3. Items to be inspected include troughs, screws, covers and drive units.
4. DO NOT ATTEMPT TO INSTALL DAMAGED COMPONENTS OR ASSEMBLIES.

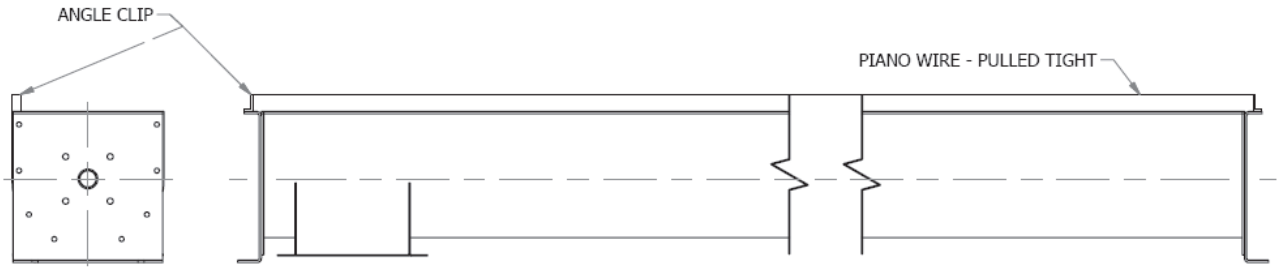
Lifting and Moving

1. Extreme care must be taken to prevent damage when moving assembled conveyors or components.
2. Spreader bars with slings are the recommended support method for lifting.
3. Unsupported span should be no greater than 12 feet.
4. NEVER LIFT A CONVEYOR WITH ONLY ONE SUPPORT POINT.
5. Unusually heavy items such as drives or gates shall be considered when choosing support points because of load balance and their bending effect.
6. Shop assembled conveyors are typically match marked and shipped in the longest sections for practical shipment.

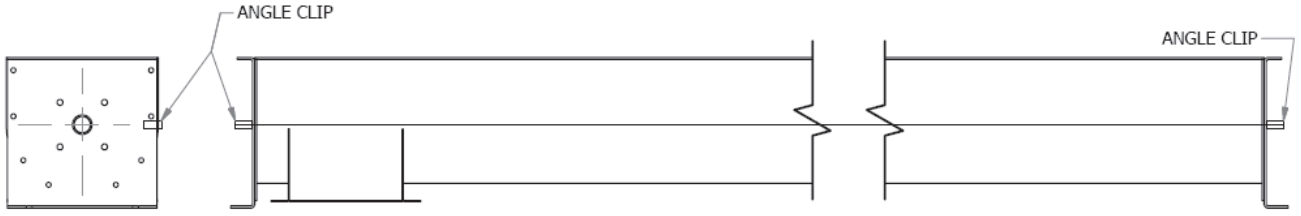
Assembly

1. The mounting surface for supporting the conveyor must be level and true.
2. Screw conveyor troughs must be assembled straight and true with no distortion.
3. Place troughs in proper sequence with discharge spout properly located.
4. Connect the joints loosely. DO NOT TIGHTEN BOLTS.
5. Assemble each trough end to proper end of conveyor.
6. Attach piano wire full length of conveyor at centerline. Make sure piano wire is pulled tight. Refer to *Figure 1* at the end of this section.
7. Tighten trough flange bolts keeping the trough assembly true to piano wire. Alignment must be checked in both horizontal and vertical directions. Maximum deviation in either direction at any point along the length of the conveyor is 1/8 inches. Torque bolts to proper torque rating per Chart A.
8. Anchor trough assembly to mounting surface. Make sure entire length of trough is straight and true. CEMA recommends supporting trough assemblies every 10 to 12 feet. Saddles and feet may be required.
9. Mount drive or thrust unit on correct trough end. Drive or thrust units are normally located at discharge end of conveyor. Make sure drive or thrust unit is centered in seal and trough end openings. Torque bolts to proper torque rating per Chart A.
10. Place the first screw section in the trough starting at the drive or thrust end. Install screw so end lugs are opposite carrying side of flight.
11. Insert screw onto drive shaft and install coupling bolts. DO NOT TIGHTEN COUPLING BOLTS.
12. Insert coupling shaft into opposite end of screw and install coupling bolts. DO NOT TIGHTEN COUPLING BOLTS.
13. Pull screw section away from drive or thrust unit to seat thrust connection.
14. Insert hanger onto coupling shaft.
15. Raise hanger and screw section until hanger top bar is flush with top of trough. Make sure correct clearance exist between outside diameter of screw and inside of trough. Match mark and drill troughs to mount hanger assembly. Insert hanger assembly bolts and hand tighten.
16. Assemble screw sections, couplings and hangers until all are installed by repeating steps 10 through 15. Install screw sections so flighting is 180 degrees from end of flighting of previous screw section.
17. Center hanger bearings between screw sections. Torque hanger assembly bolts to proper torque rating per Chart A.

18. Assemble seal and bearing to opposite trough end. Make sure end shaft is centered in seal and trough end openings. Torque bolts to proper torque rating per Chart A.
19. Insert end shaft through end bearing and into last screw section and install coupling bolts. DO NOT TIGHTEN COUPLING BOLTS.
20. Rotate entire screw assembly to check alignment and adjust hanger assemblies as required.
21. Torque ALL coupling bolts to proper torque rating. Over tightening of coupling bolts could result in failure in tension. CEMA recommends tightening coupling bolts to 75% of the values given in the **Bolt Torque Guide.** (Chart A) to eliminate over tightening of coupling bolts.
22. Adjust seals as required.
23. Remove all debris from conveyor.
24. Install covers in proper sequence starting at inlet end and attach with provided fasteners.
25. Lubricate drive and all bearings in accordance with manufacturer's instructions. DRIVES GENERALLY SHIPPED WITHOUT OIL.
26. MAKE SURE ALL CEMA SAFETY LABELS ARE IN PROPER LOCATIONS.



CEMA COMMONLY USED PIANO WIRE SETUP
Piano wire attached to top of conveyor on side



OPTIONAL PIANO WIRE SETUP
Piano wire attached to centerline of conveyor on side

Figure 1. Piano Wire Setup Diagrams

Proper equipment alignment is critical to successful long-term operation. Alignment must be checked in both horizontal and vertical directions. Maximum deviation in either direction is 1/8 inches. Please refer to the manufacturer's Operations and Maintenance Manual for additional information.

SECTION C - OPERATION

Before initial start-up

1. LOCKOUT/TAGOUT ALL POWER.
2. Lubricate all bearings in accordance with manufacturer's instructions.
3. Lubricate all gear reducers in accordance with manufacturer's instructions. Gear reducers are normally shipped without lubrication.
4. Check conveyor to ensure all tools and foreign materials have been removed.
5. Turn drive unit by hand to check for alignment and obstructions.
6. Check conveyor to ensure all covers, guards and safety devices are installed and operating properly.
7. Attach gates to inlet and discharge chutes, where applicable.

Initial start-up (without material)

1. Reenergize power to conveyor.
2. Start conveyor momentarily to check for proper conveyor rotation. If conveyor rotation is NOT correct, quickly shutdown and have qualified electrician change wiring.
3. Operate conveyor without material for several hours as a break in period. Observe for excessive bearing temperature, unusual noise or drive misalignment. If these conditions occur refer to Troubleshooting Section of this document.
4. Stop the conveyor and LOCKOUT/TAGOUT ALL POWER.
5. Remove covers and check tightness of coupling bolts. Torque bolts to proper torque rating. Over tightening of coupling bolts could result in failure in tension. CEMA recommends tightening coupling bolts to 75% of the values given in the **Bolt Torque Guide** (Chart A) to eliminate over tightening of coupling bolts. Replace covers.
6. Check all assembly and mounting bolts. Torque bolts to proper torque rating.
7. Check conveyor discharge. Discharge must be clear to ensure that material flow out of conveyor will not be impeded.

Initial start-up (with material)

1. Reenergize power to conveyor.
2. Start conveyor and operate without material for several minutes.
3. Feed material gradually until design capacity is reached.
4. DO NOT EXCEED CONVEYOR SPEED, CAPACITY AND MATERIAL DENSITY.
5. Start and stop conveyor several times. Operate conveyor for several hours with material.
6. Check motor amperage when conveying at design capacity and compare to full load amperage of motor. Problems may exist if amperage is excessive. Check voltage to ensure that it is within normal operating limits.
7. Stop the conveyor and LOCKOUT/TAGOUT ALL POWER.
8. Remove covers and check tightness of coupling bolts. Torque bolts to proper torque rating. Over tightening of coupling bolts could result in failure in tension. CEMA recommends tightening coupling bolts to 75% of the values given in the **Bolt Torque Guide** (Chart A) to eliminate over tightening of coupling bolts.
9. Check hanger bearings and realign if necessary.
10. Replace covers.
11. Check all assembly and mounting bolts. Torque bolts to proper torque rating per Chart A.

SECTION D - MAINTENANCE

Practice good housekeeping. Keep area around conveyor clean and free of obstacles to provide easy access and to avoid interference with the function of the conveyor.

Establish routine periodic inspection of the entire conveyor to ensure continuous maximum operating performance. LOCKOUT/TAGOUT ALL POWER BEFORE INSPECTION OF CONVEYORS. Periodic inspections should be made of the following:

- Bearings – Check for proper lubrication. Lubricate all bearings in accordance with manufacturer's instructions. Check hanger bearings for proper alignment and excessive wear. Replace hanger bearings when wear exceeds 1/8 inches.
- Gear Reducers – Check for proper lubrication. Lubricate all gear reducers in accordance with manufacturer's instructions.
- Drives – Check for wear on belts and proper tension. Check for lubrication on chains and proper tension. Replace belts or chains as necessary.
- Screws – Check for damage, excessive wear and material buildup. Replace screw sections as necessary.
- Troughs – Check for damage, excessive wear and material buildup. Check trough alignment using piano wire as described in Installation Section of this document. Replace trough sections as necessary.
- Shafts – Check for bolt hole elongation and wear. Check for run-out. Replace shafts when wear exceeds 1/8 inches.
- Seals – Check for leakage. Adjust seal or replace packing as necessary.
- Coupling Bolts – Check for wear. Replace worn coupling bolts as necessary. It is recommended to replace coupling bolts and lock nuts when replacing screw sections. Torque ALL coupling bolts to proper torque rating. Over tightening of coupling bolts could result in failure in tension. CEMA recommends tightening coupling bolts to 75% of the values given in the **Bolt Torque Guide** (Chart A) to eliminate over tightening of coupling bolts.
- Assembly Bolts – Check for tightness. Torque ALL assembly bolts to proper torque rating per Chart A.
- Guards – Check for clearance and bolt tightness. Check oil level on oil-tight guards.

Replacing screw coneyor components

1. LOCKOUT/TAGOUT ALL POWER
2. Removal of a screw section must proceed from the end opposite the drive or thrust unit.
3. Remove trough end, screw sections, coupling shafts and hangers until the damaged screw section is reached and removed.
4. Reassemble conveyor components in accordance with the Installation Section of this document.

NOTE: Quick disconnect screws can be removed at intermediate locations without first removing adjacent sections.

SECTION E - SHUTDOWN AND STORAGE

Emergency shutdown

An emergency shutdown may be necessary to clear obstructions or to replace damaged or worn components.

1. LOCKOUT/TAGOUT ALL POWER.
2. Remove all covers.
3. Remove all obstructions and product from conveyor.
4. Inspect all components for damage or wear. Check conveyor components in accordance with the Maintenance Section of this document.
5. Replace all damaged or worn components. Replace conveyor components in accordance with the Installation Section of this document.
6. Turn drive unit by hand to check for alignment and obstructions.
7. Replace all covers and guards.
8. Restart conveyor in accordance with the Operation Section of this document.

Extended shutdown

An extended shutdown may be necessary if the conveyor is not in operation for a long period of time.

1. Operate conveyor until all product is removed.
2. LOCKOUT/TAGOUT ALL POWER.
3. Remove all covers.
4. Remove all obstructions and product from conveyor.
5. Inspect all components for damage or wear. Check conveyor components in accordance with the Maintenance Section of this document.
6. Replace all damaged or worn components. Replace conveyor components in accordance with the Installation Section of this document.
7. Lubricate drive and all bearings in accordance with manufacturer's instructions.
8. Coat all exposed metal surfaces with rust preventative.
9. Rotate screws by hand every week. Screws may sag and permanently deform if not rotated.

NOTE: When operation is to resume, restart conveyor in accordance with the Operation Section of this document

Storage

1. Protect conveyor from weather, moisture and extreme temperatures. DO NOT use coverings that promote condensation.
2. Coat all exposed metal surfaces with rust preventative.
3. Rotate screws by hand every week. Screws may sag and permanently deform if not rotated.

NOTE: When operation is to resume, restart conveyor in accordance with the Operation Section of this document.

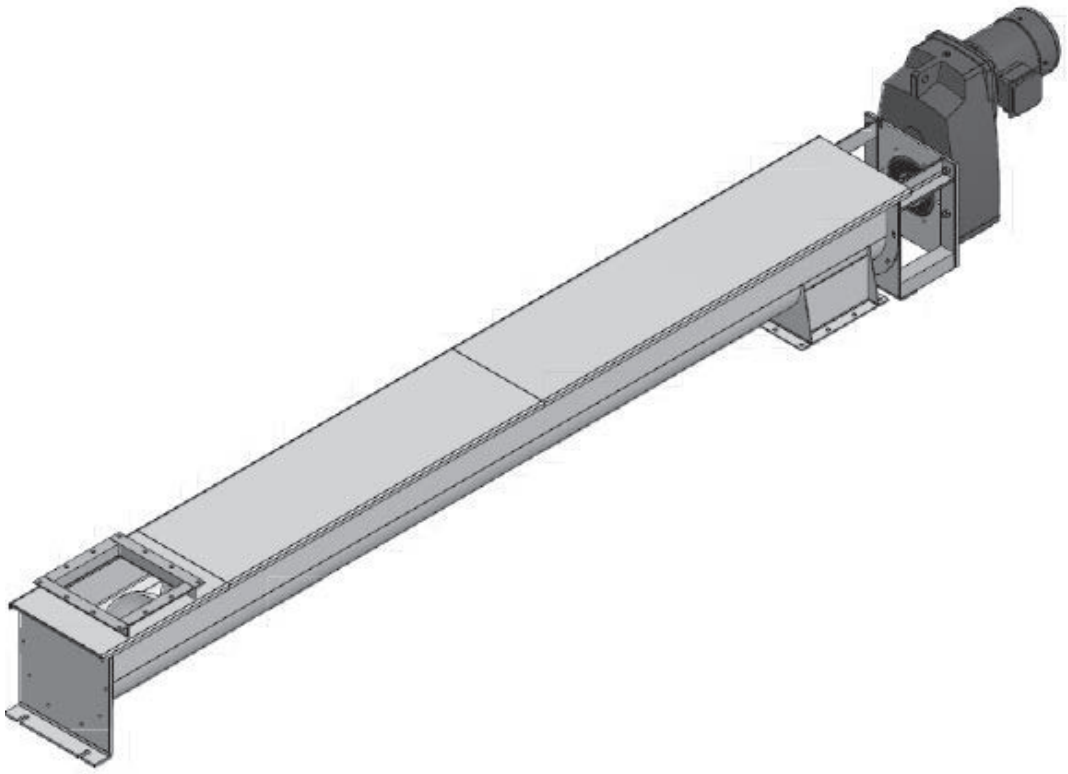
TROUBLESHOOTING GUIDE

Type of Failure	Probable Cause / Corrective Action
Premature Trough Failure	• **Trough Gauge (thickness) too light.** Increase thickness. Consult Thomas catalog materials table / component series for recommendation. • **Screw deflection.** Eliminate excessive deflection. Consult Thomas catalog for calculation procedure to determine proper pipe size and screw length. • **Bent screw.** Straighten or replace. Check before operation.
Accelerated Flight Tip Wear	• **Gauge (thickness) too light.** Increase thickness. Consider hardfacing or use abrasion resistant materials. • **RPM too high.** Slow conveyor down. Consult Thomas catalog engineering section to determine proper trough loading.
Coupling Shaft Breakage	• **Torque capacity insufficient.** Increase torque capacity or use larger shaft. Check motor amp demand for torque requirements. • **Incorrect alignment.** Realign trough assembly and hangers in accordance with installation instructions. • **Excessive shaft wear.** Replace coupling shaft.
Shaft Hole Elongation	• **Insufficient numbers of bolts.** Increase number of bolts. • **Conveyor subject to "jogging" or too frequent stop/start, or frequent overloads.** Cease jogging or frequent stop/start or overload. If this is not possible increase bearing capacity of shaft and/or increase number of bolts.
Drive Shaft Breakage	• **Insufficient torque capacity.** Increase torque capacity. • **Obstruction in conveyor.** Check screw alignment.
Motor / Heaters Overload	• **Amp demand excessive for motor.** Recheck horsepower calculations. Check material characteristics. Check capacity. Regulate feed. • **Upset loading conditions.** Empty trough. Operate under design specifications.
Inlet Trough End Bearing Failure	• **Material getting into bearing.** Add or upgrade seal to keep material out of bearing. Change to outboard bearing. • **Insufficient lubrication.** Lubricate properly. • **Shaft slope.** Align screw. Check for excessive screw deflection and for bent screw.
Discharge Trough End Bearing Failure	• **Material getting into bearing.** Add or upgrade seal. Change to outboard bearing. Cut off flight at center of discharge.
Hanger Bearing Failure	• **Incorrect alignment.** Realign trough assembly and hanger. • **Heat due to hot material being conveyed.** Use appropriate bearing material. • **Heat due to insufficient lubrication.** Properly lubricate. • **Thrust due to pipe pressing on bearing insert.** Check coupling bolts and holes for elongation and wear. Replace as necessary to get proper clearances. • **Improper bearing material.** For material being conveyed consult Thomas catalog for proper bearing. • **Improper speed.** For material being conveyed consult Thomas catalog for proper speed. • **Improper trough loading.** For material being conveyed consult Thomas catalog for proper trough loading.

CEMA Guide No. 353 - 2018
Revision of CEMA No. 353 - 2014
Approved: March 2018

CEMA Guide No. 353

Shaftless Screw Conveyor Safety, Operation, and Maintenance Guide



Conveyor Equipment Manufacturers Association, Inc.

DISCLAIMER

The information provided herein is advisory only.

These recommendations provided by CEMA are general in nature and are not intended as a substitute for professional advice. Users should seek the advice, supervision and/or consultation of qualified engineers, safety consultants, and other qualified professionals.

Any use of this publication, or any information contained herein, or any other CEMA publication is made with the agreement and understanding that the user and the user's company assume full responsibility for the designs, safety, specifications, suitability and adequacy of any conveyor system, a system component, mechanical or electrical device designed or manufactured using this information.

The user and the user's company understand and agree that CEMA, its member companies, its officers, agents and employees are not and shall not be liable in any manner under any theory of liability to anyone for reliance on or use of this information. The user and the user's companies agree to release, hold harmless and indemnify and defend CEMA, its member companies, successors, assigns, officers, agents and employees from any and all claims of liability, costs, fees (including attorney's fees), or damages arising in any way out of the use of this information.

CEMA and its member companies, successors, assigns, officers, agents and employees make no representations or warranties whatsoever, either expressed or implied, about the information contained herein, including, but not limited to, representations or warranties that the information contained herein conform to any federal, state or local laws, regulations, guidelines or ordinances.

ISBN 1-891171-83-3

Conveyor Equipment Manufacturers Association, Inc. (CEMA)
www.cemanet.org

INTRODUCTION

The CEMA's *Screw Conveyor Committee* was assigned the task of bringing together, under one cover, the accumulated experience of many individuals and their companies in an effort to provide a common basis for the safety, operation and maintenance of screw conveyors.

The **Shaftless Screw Conveyor Safety, Operation, and Maintenance Guide** contains instructions for the safe installation, operation, and maintenance of shaftless screw conveyors. The reliability and service life depend on the proper care taken while installing and preparing the equipment for its intended use.

Read **ALL** instructions in this guide and manufacturer's manuals **BEFORE** installing, operating and maintaining the equipment.

TABLE OF CONTENTS

SECTION A - SAFETY

Screw conveyor safety begins with a plan that considers every possible danger and potential hazard. Operation and maintenance personnel must be thoroughly trained in safe operating procedures, recognition of possible hazards, and maintenance of a safe area around screw conveyors.

CEMA has a comprehensive safety program that includes:

- CEMA Technical Document SC 2018-01: Warning and Safety Reminder for Screw, Drag, and Bucket Elevators Conveyors
- CEMA Brochure No. 201: Safety Label Brochure
- CEMA Safety Label Placement Guidelines by Product:
  - Screw Conveyors (CEMA Document: SC-2)
  - Vertical Screw Conveyors (CEMA Document: SC-3)
- CEMA Screw Conveyor Safety Poster
- CEMA A/V 6: Screw Conveyor, Drag Conveyor, and Bucket Elevator Safety Video - This video describes key safety practices that personnel must follow when operating and maintaining screw conveyors, drag conveyors, and bucket elevators.

Screw conveyor accidents can be avoided by the implementation and enforcement of an in-plant safety program. A number of safety precautions are included in this guide. Carefully study and follow the safety precautions.

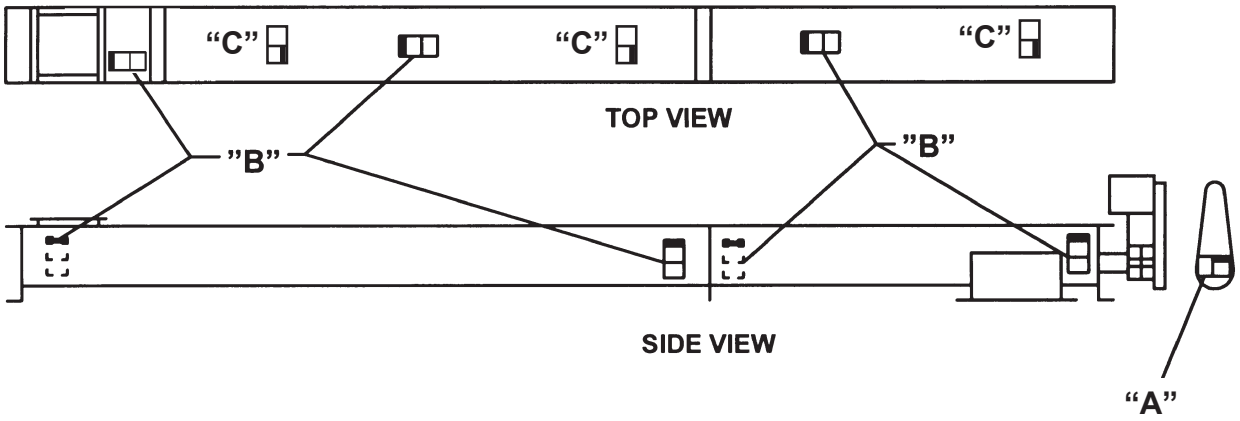
Remember

Accidents are usually caused by negligence or carelessness.

CEMA Safety Labels Placement Guidelines

Product: Bulk Handling Equipment

Equipment: Screw Conveyors (**SC-2**)



NEAR SIDE

FAR SIDE

Use Label "A" on belt guard.
Use Label "B" on ends of trough, middle of covers, and at inlet opening.
Use Label "C on top of covers.

"A"

To be placed on removable guards to warn that operation of the machinery with guards removed would expose chains, belts, gears, shafts, pulleys, couplings, etc. which create hazards.

"C"

To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation

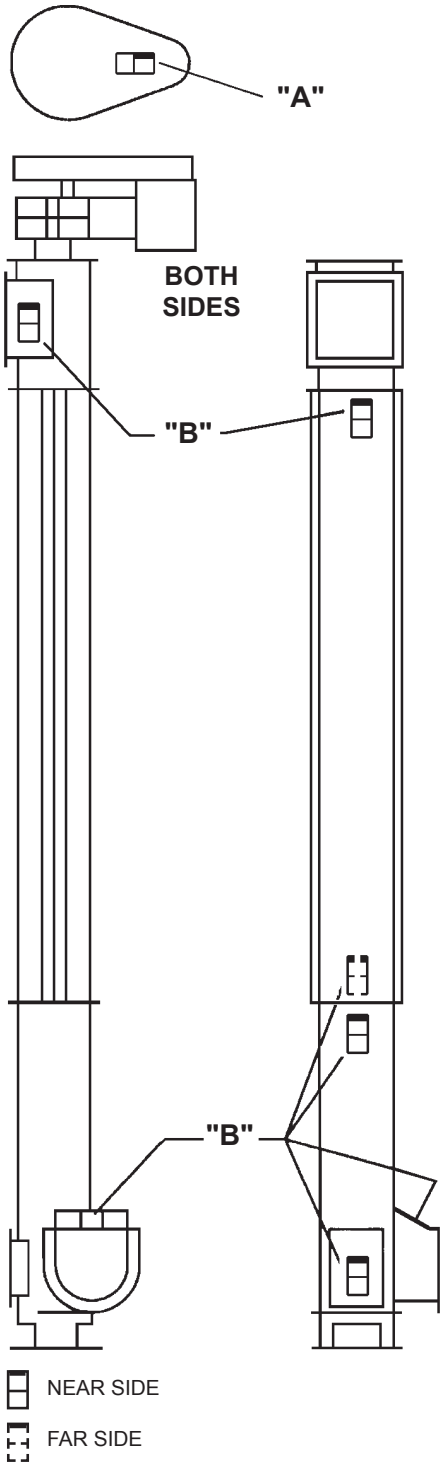
"B"

To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation

CEMA Safety Labels Placement Guidelines

Product: Bulk Handling Equipment

Equipment: Vertical Screw Conveyors (**SC-3**)



Use Label “A” on belt guard.
Use Label “B” on ends of trough, on intake inspection door, and both sides of discharge spout.

“A”

To be placed on removable guards to warn that operation of the machinery with guards removed would expose chains, belts, gears, shafts, pulleys, couplings, etc. which create hazards.

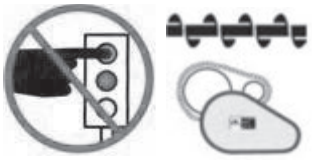
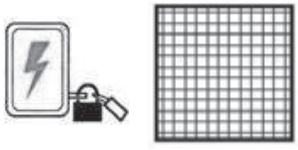
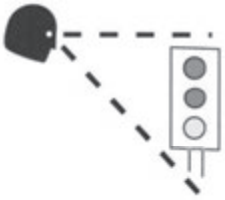
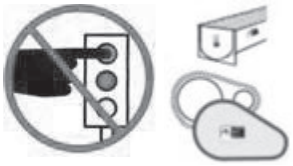
“B”

To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation

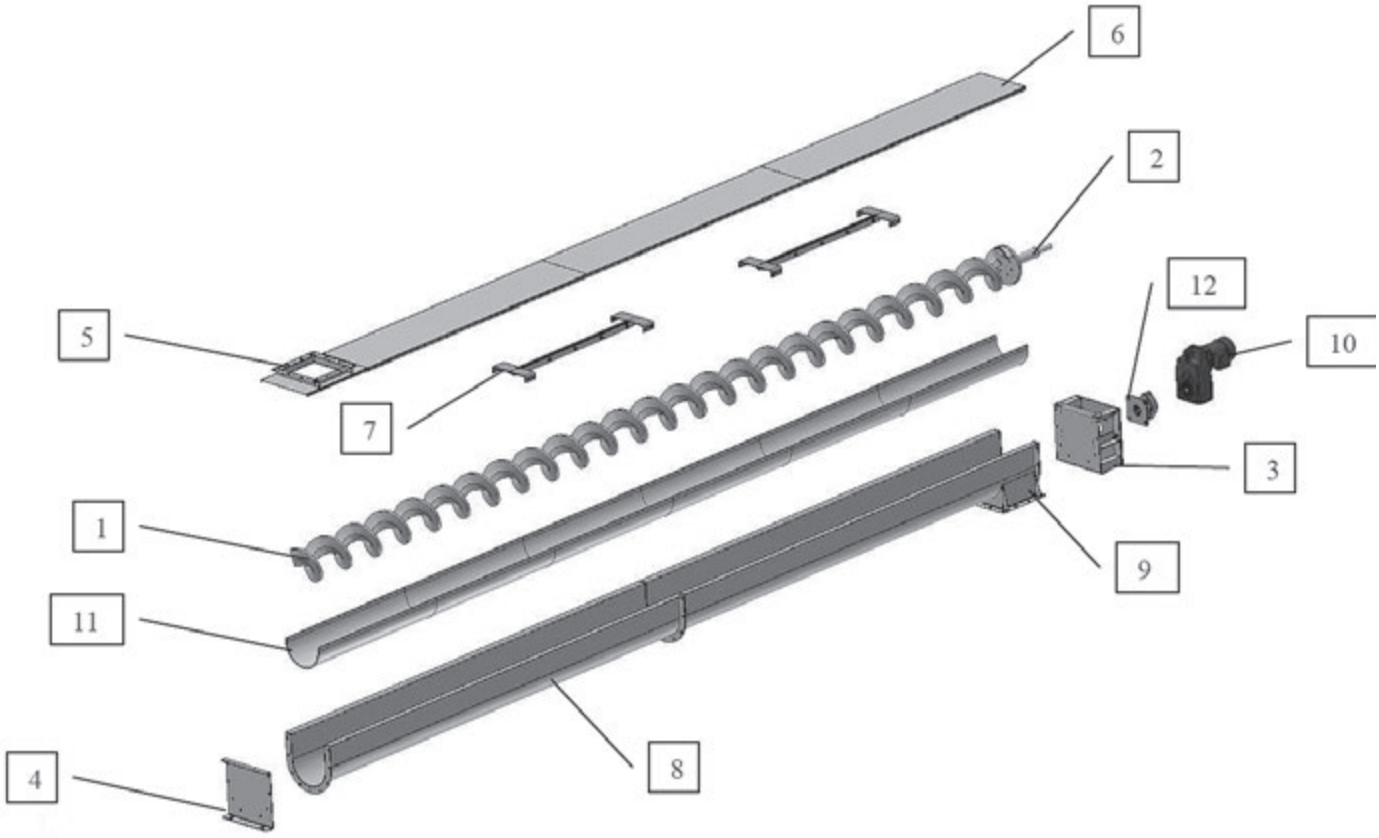
CEMA Screw Conveyor Safety Poster

CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION

Screw Conveyors

 Do not climb, sit, stand,or walk on the conveyor at any time.	 Do not perform maintenance on conveyor until electrical, air, hydraulic, and gravity energy sources have been locked out and blocked.	 Operate equipment only with all approved covers and guards in place.
 LOCK OUT ALL power and block gravity loads before servicing.	 Ensure that all personnel are clear of equipment before starting.	 Allow only authorized personnel to operate or maintain material handling equipment.
 Keep clothing, body parts, and hair away from conveyors.	 Clean up spillage near moving parts ONLY when the power is locked out AND guards are in place.	 Do NOT modify conveyor controls.
 Ensure that ALL controls are visible and accessible.	 Operate equipment only with all approved covers, guards, and safety labels in place.	 Report all unsafe conditions.

POST IN PROMINENT AREA



Bill of Materials	
Item	**Description**
1	Shaftless Spiral
2	Drive Shaft
3	Drive End Trough End
4	Tail End Trough End
5	Inlet
6	Cover
7	Hold Down
8	Trough
9	Discharge Spout
10	Screw Conveyor Drive Unit
11	Trough Liner
12	Screw Conveyor Drive Adapter

SECTION B - INSTALLATION

Receiving

1. Screw conveyors may be ordered as individual components with all the assembly operations performed in the field, or assembled completely by the manufacturer, with drawings and a bill of materials.
2. Immediately upon receipt all items in the shipment should be checked against shipping papers for shortages and inspected for damage.
3. Items to be inspected include troughs, shaftless spiral, trough liners, covers, and drive units.
4. DO NOT ATTEMPT TO INSTALL DAMAGED COMPONENTS OR ASSEMBLIES.

Lifting and Moving

1. Extreme care must be taken to prevent damage when moving assembled conveyors or components.
2. Spreader bars with slings are the recommended support method for lifting.
3. Unsupported span should be no greater than 12 feet.
4. NEVER LIFT A CONVEYOR WITH ONLY ONE SUPPORT POINT.
5. Unusually heavy items such as drives or gates shall be considered when choosing support points because of load balance and their bending effect.
6. Shop-assembled conveyors are typically match-marked and shipped in the longest sections for practical shipment.

Assembly

1. The mounting surface for supporting the conveyor must be level and true.
2. Screw conveyor troughs must be assembled straight and true with no distortion.
3. Place troughs in proper sequence with the discharge spout properly located.
4. Connect the joints loosely. DO NOT TIGHTEN BOLTS.
5. Assemble each trough end to the proper end of the conveyor.
6. Attach the piano wire full length of the conveyor at the centerline. Make sure the piano wire is pulled tight. Refer to Figure 1 at the end of this section.
7. Tighten trough flange bolts keeping the trough assembly true to the piano wire. Torque bolts to proper torque rating per Chart A.
8. Anchor trough assembly to the mounting surface. CEMA recommends supporting trough assemblies every 10 feet to 12 feet. Saddles and feet may be required.
9. Install liner section(s) using original equipment manufacturers recommended procedure.
10. Mount drive unit on trough end. Drive units are normally located at the discharge end of the conveyor. Make sure the drive is centered in the seal and trough end openings. Torque bolts to proper torque rating per Chart A.
11. Place the shaftless spiral section in the trough starting at the drive or thrust end.
12. Assemble the drive trough end to the correct end of the conveyor. Torque bolts to proper torque rating per Chart A.
13. Assemble the seal to drive trough end. DO NOT TIGHTEN BOLTS.
14. Insert the drive shaft from the inside trough through the seal and outer trough end.
15. Insert the drive shaft into the bore of the reducer.
16. Mate shaftless spiral to drive shaft and install bolts. DO NOT TIGHTEN BOLTS.
17. Rotate the entire shaftless spiral assembly to check alignment and adjust as required.
18. Torque ALL drive shaft bolts to proper torque rating per Chart A.
19. Adjust seals as required.
20. Remove all debris from the conveyor.
21. Install hold-downs.

22. Install covers in proper sequence starting at the inlet end and attach them with provided fasteners.
23. Lubricate the drive and all bearings following the manufacturer's instructions. DRIVES ARE GENERALLY SHIPPED WITHOUT OIL.
24. MAKE SURE ALL CEMA SAFETY LABELS ARE IN THE PROPER LOCATIONS.

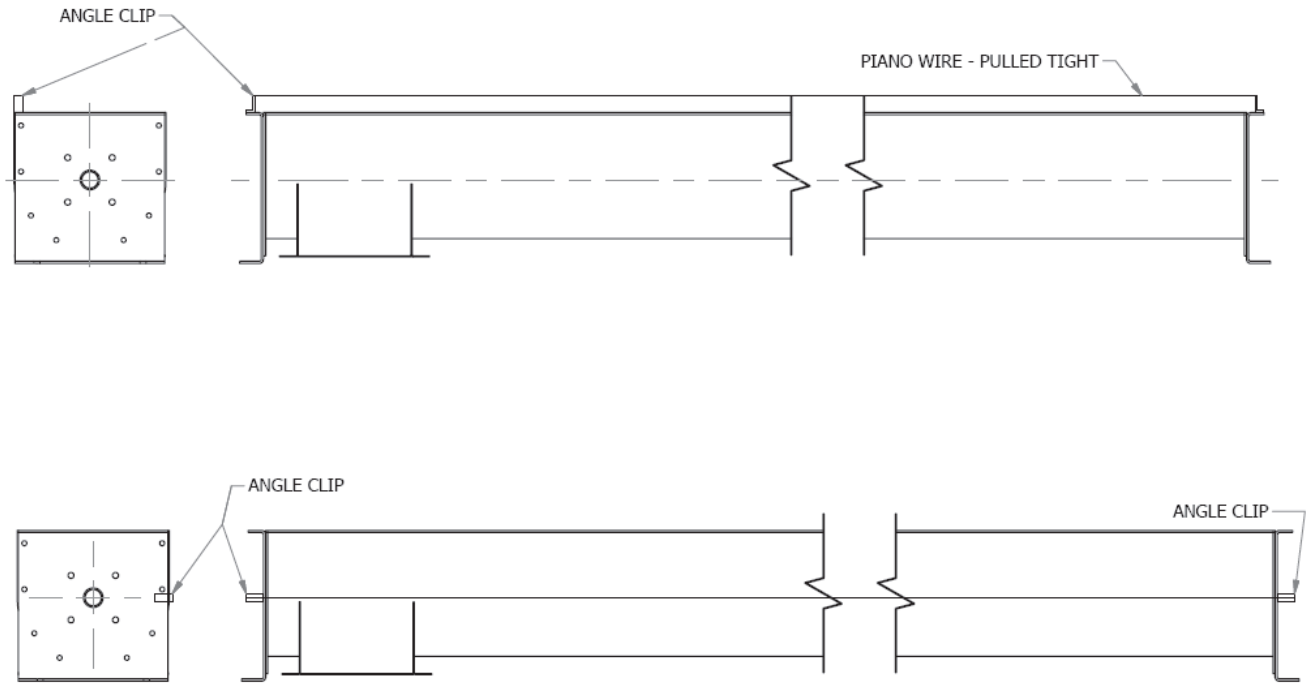


Figure 1. Piano Wire Setup Diagrams

Proper equipment alignment is critical to successful long-term operation. Alignment must be checked in both horizontal and vertical directions. The maximum deviation in either direction is 1/8 inch. Please refer to the Manufacturer's Operations and Maintenance Manual for additional information.

SECTION C - OPERATION

Before initial start-up

1. LOCKOUT/TAGOUT ALL POWER.
2. Lubricate all bearings following the manufacturer's instructions.
3. Lubricate all gear reducers following the manufacturer's instructions. Gear reducers are normally shipped without lubrication.
4. Check the conveyor to ensure all tools and foreign materials have been removed.
5. Turn the drive unit by hand to check for alignment and obstructions.
6. Check the conveyor to ensure all covers, guards, and safety devices are installed and operating properly.

Initial start-up (without material)

1. Reenergize power to the conveyor.
2. Start conveyor momentarily to check for proper conveyor rotation. If conveyor rotation is NOT correct, quickly shutdown and have a qualified electrician change the wiring.
3. Operate the conveyor without material for several hours as a break-in period. Observe for excessive bearing temperature, unusual noise, or drive misalignment. If these conditions occur refer to the Troubleshooting Section of this document.
4. Stop the conveyor and LOCKOUT/TAGOUT ALL POWER.
5. Remove covers and check the tightness of bolts. Torque bolts to proper torque rating per Chart A. Replace covers.
6. Check all assembly and mounting bolts. Torque bolts to proper torque rating.
7. Check conveyor discharge. Discharge must be clear to ensure that material flow out of the conveyor will not be impeded.

Initial start-up (with material)

1. Reenergize power to the conveyor.
2. Start the conveyor and operate it without material for several minutes.
3. Feed material gradually until design capacity is reached.
4. DO NOT EXCEED CONVEYOR SPEED, CAPACITY, AND MATERIAL DENSITY.
5. Start and stop the conveyor several times. Operate conveyor for several hours with material.
6. Check motor amperage when conveying at design capacity and compare to full load amperage of motor. Problems may exist if the amperage is excessive. Check voltage to ensure that it is within normal operating limits.
7. Stop the conveyor and LOCKOUT/TAGOUT ALL POWER.
8. Remove covers and check the tightness of coupling bolts. Torque bolts to proper torque rating per Chart A.
9. Replace covers.
10. Check all assembly and mounting bolts. Torque bolts to proper torque rating per Chart A.

SECTION D - MAINTENANCE

Practice good housekeeping. Keep the area around the conveyor clean and free of obstacles to provide easy access and avoid interference with the function of the conveyor.

Establish routine periodic inspections of the entire conveyor to ensure continuous maximum operating performance. LOCKOUT/TAGOUT ALL POWER BEFORE INSPECTION OF CONVEYORS. Periodic inspections should be made of the following:

- Gear Reducers – Check for proper lubrication. Lubricate all gear reducers following the manufacturer's instructions.
- Drives – Check for wear on belts and proper tension. Check for lubrication on chains and proper tension. Replace belts or chains as necessary.
- Shaftless Spiral - Check for damage, excessive wear, and material buildup. Replace screw sections as necessary.
- Troughs – Check for damage, excessive wear, and material buildup. Check trough alignment using piano wire as described in the Installation Section of this document. Replace trough sections as necessary.
- Trough Liners – Check for damage, excessive wear, and material buildup. Replace liner sections if wear exceeds 1/4 inch.
- Shafts – Check the tightness of the thrust washer and bolt. Check for run-out. Torque bolts to proper torque rating.
- Seals – Check for leakage. Adjust the seal or replace the packing as necessary.
- Assembly Bolts – Check for tightness. Torque ALL assembly bolts to proper torque rating per Chart A.
- Guards – Check for clearance and bolt tightness.

Replacing shaftless spiral

1. LOCKOUT/TAGOUT ALL POWER
2. Removal of a shaftless spiral section must proceed from the end opposite the drive unit.
3. Remove all covers and hold-downs. Disconnect the drive shaft and remove the damaged screw section.
4. Insert replacement shaftless spiral section.
5. Reassemble conveyor components in accordance with the Installation Section of this document.

Replacing trough liner

1. LOCKOUT/TAGOUT ALL POWER
2. Removal of a shaftless spiral section must proceed from the end opposite the drive unit.
3. Remove all covers and hold-downs. Disconnect the drive shaft and remove the SHAFTLESS SPIRAL AND DAMAGED LINER.
4. Insert replacement liner.
5. Reassemble conveyor components in accordance with the Installation Section of this document.

SECTION E - SHUTDOWN AND STORAGE

Emergency shutdown

An emergency shutdown may be necessary to clear obstructions or to replace damaged or worn components.

1. LOCKOUT/TAGOUT ALL POWER.
2. Remove all covers.
3. Remove all obstructions and products from the conveyor.
4. Inspect all components for damage or wear. Check conveyor components in accordance with the Maintenance Section of this document.
5. Replace all damaged or worn components. Replace conveyor components in accordance with the Installation Section of this document.
6. Turn the drive unit by hand to check for alignment and obstructions.
7. Replace all covers and guards.
8. Restart the conveyor in accordance with the Operation Section of this document.

Extended shutdown

An extended shutdown may be necessary if the conveyor is not in operation for a long period of time.

1. Operate the conveyor until all product is removed.
2. LOCKOUT/TAGOUT ALL POWER.
3. Remove all covers.
4. Remove all obstructions and products from the conveyor.
5. Inspect all components for damage or wear. Check conveyor components in accordance with the Maintenance Section of this document.
6. Replace all damaged or worn components. Replace conveyor components in accordance with the Installation Section of this document.
7. Lubricate the drive and all bearings following the manufacturer's instructions.
8. Coat all exposed metal surfaces with rust preventative.

Note: When the operation is to resume, restart the conveyor in accordance with the Operation Section of this document.

Storage

1. Protect the conveyor from weather, moisture, and extreme temperatures. DO NOT use coverings that promote condensation.
2. Coat all exposed metal surfaces with rust preventative.

Note: When the operation is to resume, restart the conveyor in accordance with the Operation Section of this document.

SECTION F - TROUBLESHOOTING GUIDE

Problem	Cause	Remedy
1. Accelerated shaftless spiral wear.	Shaftless spiral material too soft.	Use a hardier spiral.
	rpm too high or trough loading too high.	Reduce speed.
2. Premature trough failure or liner.	Liner is too thin	Increase liner thickness. Use a liner with better wear resistance.
	Alignment	Straighten or replace the screw.
3. Drive shaft breakage.	Excessive torque/improper alignment.	Consult ANSI/CEMA Standard No. 350 to determine the proper torque rating.
4. Motor overload	Motor undersized	Consult ANSI/CEMA Standard No. 350 to determine proper horsepower requirements.

Phone: 817-295-7151
Toll Free: 800-433-2217
Fax: 817-447-3840
thomasconveyor.com