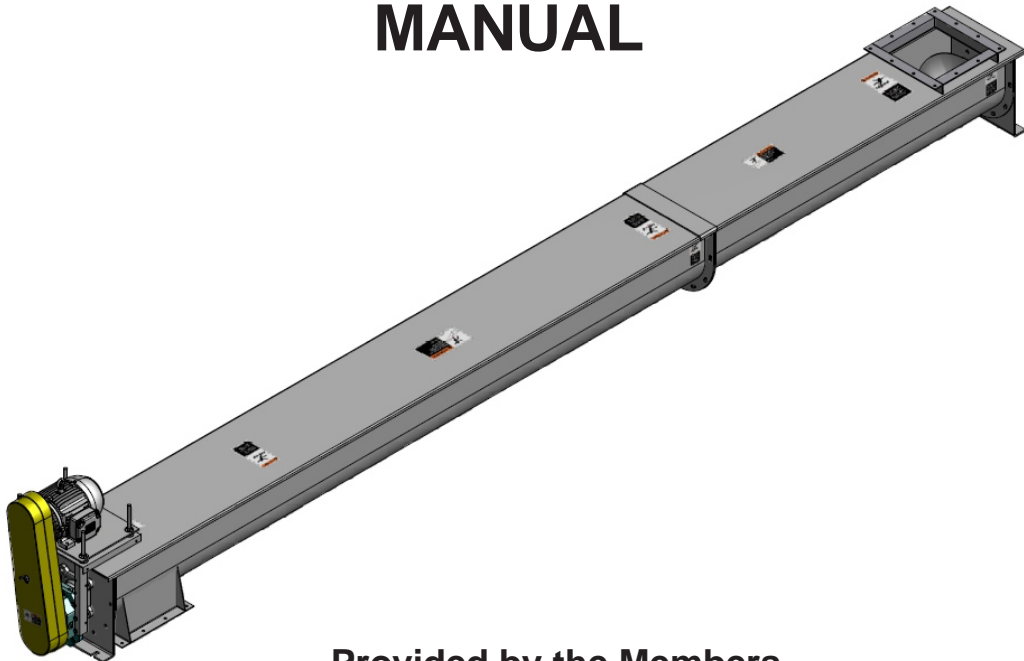


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Approved: September 19, 2012



SCREW CONVEYOR SAFETY OPERATION AND MAINTENANCE MANUAL



Provided by the Members
of the
Screw Conveyor and Bucket Elevator Section
of the
Conveyor Equipment Manufacturers Association
as a service to the industry

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Conveyor Equipment Manufacturers Association

5672 Strand Court, Suite 2

Naples, Florida 34110-3314

www.cemanet.org

CEMA Screw Conveyor Safety, Operation & Maintenance Manual

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INTRODUCTION

The Screw Conveyor and Bucket Elevator Engineering Committee of the CEMA (Conveyor Equipment Manufacturers Association) Engineering Conference 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 CEMA Safety, Operation & 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.

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:

- Warning and Safety Reminder for Screw Conveyors, Drag Conveyors and Bucket Elevators - (CEMA Document: SC2004-01)
- CEMA Safety Label Brochure - (CEMA Document: 201)
- CEMA Safety Label Placement Guidelines:
 - Screw Conveyor - (CEMA Document: SC-2)
 - Vertical Screw Conveyor - (CEMA Document: SC-3)
- Screw Conveyor Safety Poster - (CEMA Screw Conveyor Safety Poster)
- Screw Conveyor, Drag Conveyor and Bucket Elevator Safety Video - (CEMA Document: AV6) 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 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.

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

*APPROVED FOR DISTRIBUTION BY THE SCREW CONVEYOR 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.

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 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 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 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 area around 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 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, 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, 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 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.

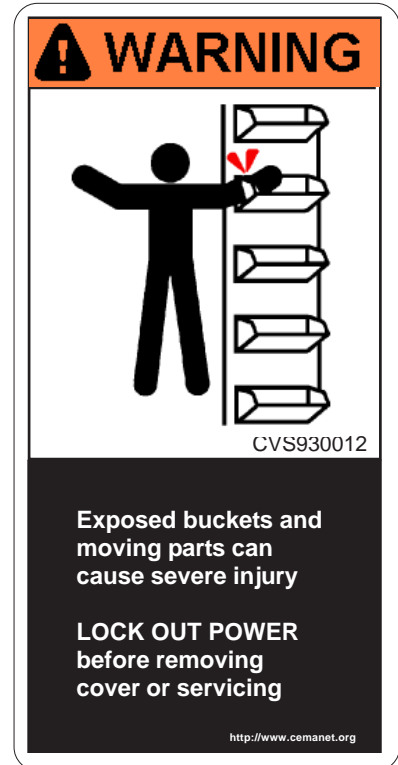
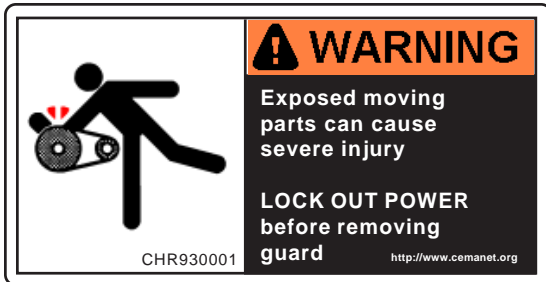
The Conveyor Equipment Manufacturers Association (CEMA) has produced an audio-visual presentation entitled "Safe Operation of Screw Conveyors, Drag Conveyors, and Bucket Elevators." CEMA encourages acquisition and use of this source of safety information to supplement your safety program.

SEE NEXT PAGE FOR SAFETY LABELS

CEMA Safety Labels

CEMA Document: SC 2004-01

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 Web Site: <http://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
5624 Strand Court, Suite 2., Naples, Florida 34110
239-514-3441
<http://www.cemanet.org>

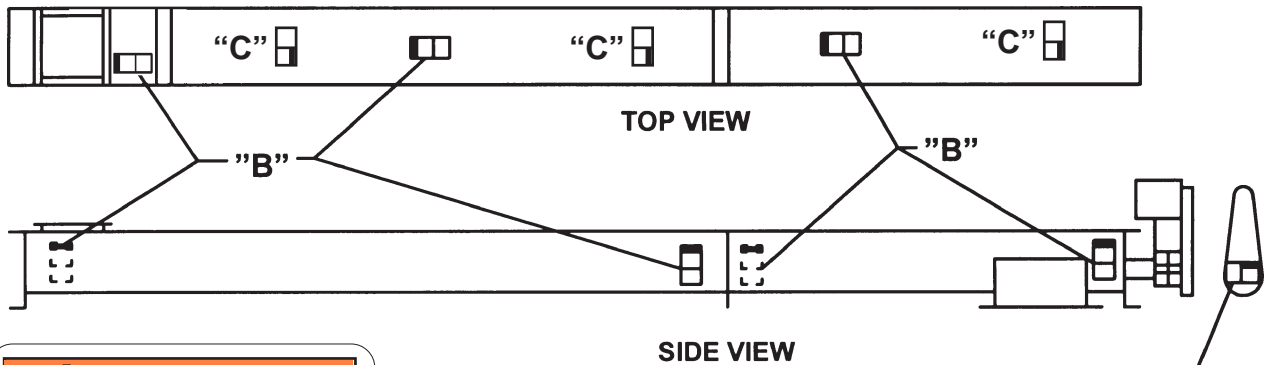


CEMA Safety Labels

Placement Guidelines

Product: Bulk Handling Equipment

Equipment: Screw Conveyor



WARNING

CVS930011

Exposed screw and moving parts can cause severe injury

LOCK OUT POWER before removing cover or servicing

<http://www.cemanet.org>

“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.

WARNING

CHR930001 <http://www.cemanet.org>

Exposed moving parts can cause severe injury

LOCK OUT POWER before removing guard

“A”

WARNING

CHS991026 <http://www.cemanet.org>

Walking or standing on conveyor covers or gratings can cause severe injury

STAY OFF

“C”

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

- 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

CEMA Safety Labels

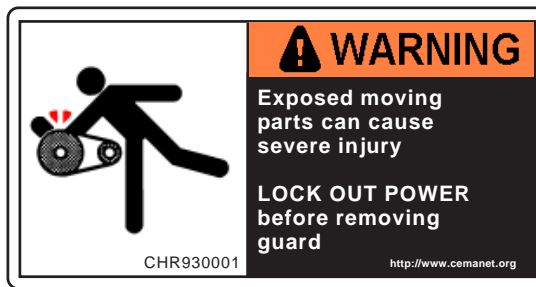
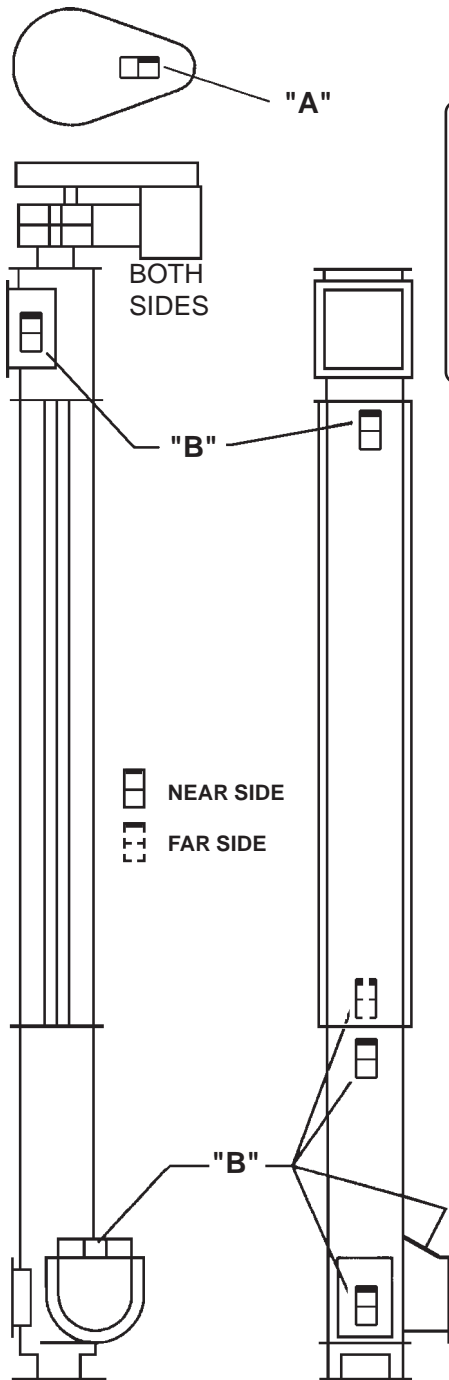
Placement Guidelines

Product: Bulk Handling Equipment

Equipment: Vertical Screw Conveyor

USE LABEL "A" ON BELT GUARD

USE LABEL "B" ON ENDS OF TROUGH,
ON INTAKE INSPECTION DOOR,
AND
BOTH SIDES OF DISCHARGE SPOUT



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

"A"



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"



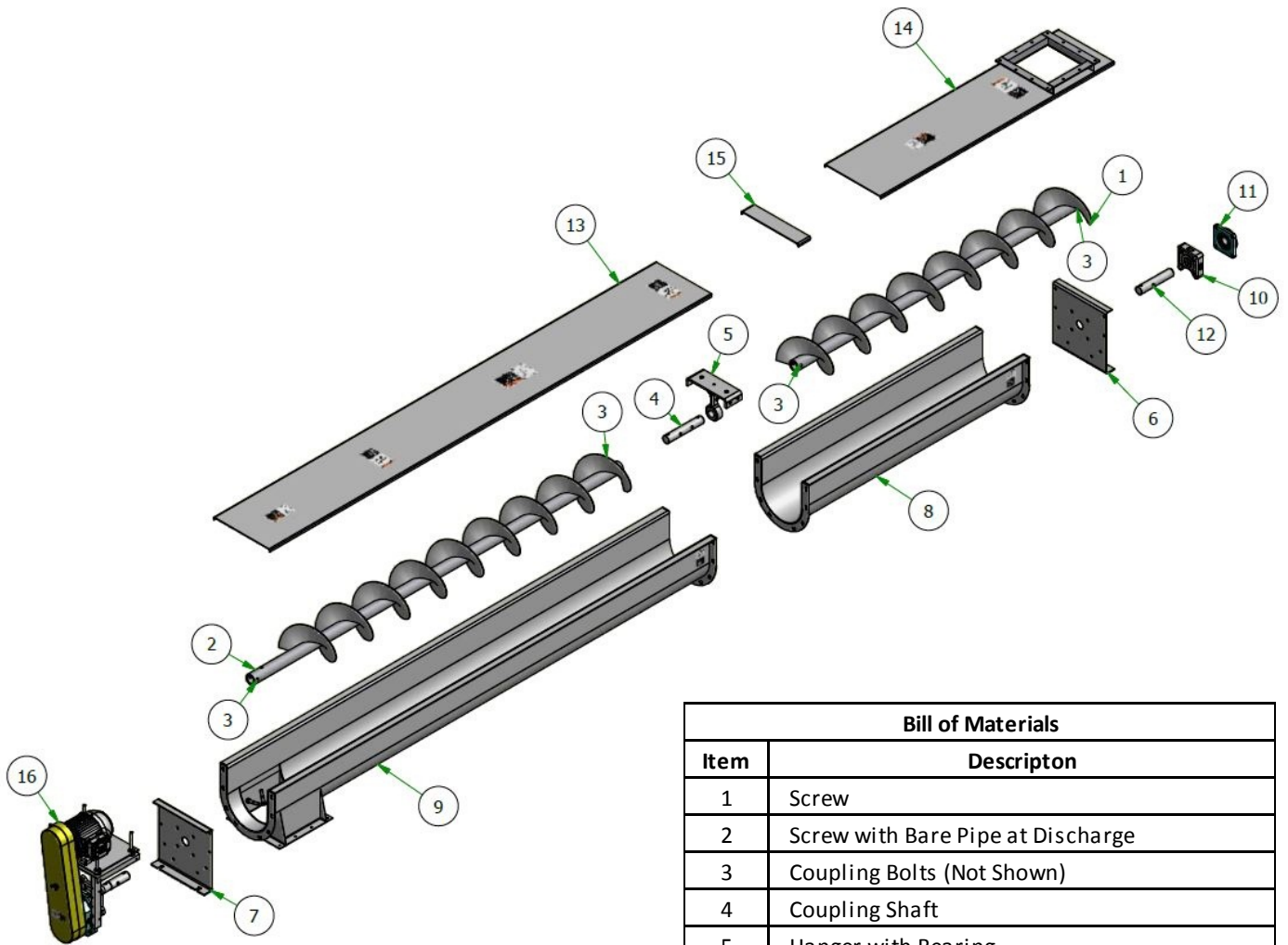
Screw Conveyor Safety



 <p>Do Not Climb, Sit, Stand or Walk, On Conveyor At Any Time</p>	 <p>Do Not Perform Maintenance on Conveyor Until Electrical, Air, Hydraulic and Gravity Energy Sources Have Been Locked Out and Blocked</p>	 <p>Operate Equipment Only With All Approved Covers and Guards in Place</p>
 <p>LOCK OUT ALL Power and Block Gravity Loads Before Servicing</p>	 <p>Ensure That All Personnel Are Clear of Equipment Before Starting</p>	 <p>Allow Only Authorized And Trained Personnel To Operate or Maintain Conveyors and Accessories</p>
 <p>Keep Clothing, Body Parts, and Hair Away from Conveyors</p>	 <p>Clean Up Spillage Near Moving Parts ONLY When the Power Is Locked Out AND Guards Are In Place</p>	 <p>DO NOT Modify Conveyor Controls</p>
 <p>Ensure That All Controls are Visible and Accessible</p>	 <p>Operate Equipment Only With All Approved Covers, Guards, and Safety Labels In Place</p>	 <p>Report All Unsafe Conditions</p>

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	Trough End for Screw Conveyor Drive
8	Trough End for Screw Conveyor Drive
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 Drive, and Guard

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.**

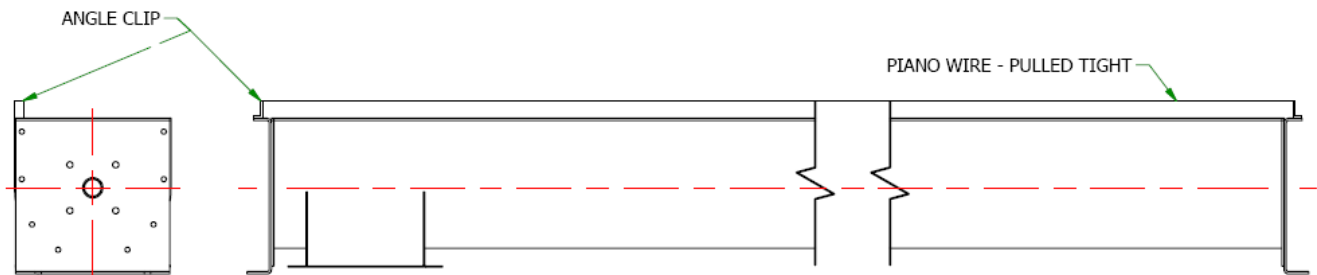
LIFTING AND MOVING

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.

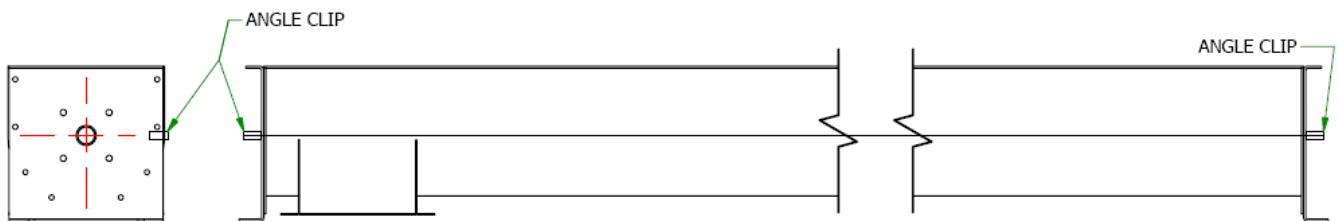
ASSEMBLY

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". 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-percent of the values given in the Bolt Torque Guide 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

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-percent of the values given in the Bolt Torque Guide 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-percent of the values given in the Bolt Torque Guide 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 inch.
- 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 Assembly 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 inch.
- 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-percent of the values given in the Bolt Torque Guide 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 CONVEYOR 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 Assembly 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 Assembly 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 Assembly 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.

SECTION F – TROUBLESHOOTING GUIDE

PROBLEM	CAUSE	REMEDY
1. ACCELERATED FLIGHT WEAR	FLIGHT THICKNESS TOO LIGHT	INCREASE FLIGHT THICKNESS. USE ABRASION RESISTANT METERIALS OR HARDFACING
	RPM TOO HIGH OR TROUGH LOADING TOO HIGH	REDUCE SPEED. CONSULT CEMA 350 BOOK TO DETERMINE RECOMMENDED SPEED AND TROUGH LOADING.
2. HANGER BEARING FAILURE	INCORRECT ALIGNMENT	REALIGN TROUGH ASSEMBLY AND HANGERS IN ACCORDANCE WITH ASSEMBLY SECTION OF THIS DOCUMENT.
	IMPROPER SPEED AND TROUGH LOADING	CONSULT CEMA 350 BOOK TO DETERMINE RECOMMENDED SPEED AND TROUGH LOADING.
	IMPROPER HANGER BEARING MATERIAL	CONSULT CEMA 350 BOOK TO DETERMINE RECOMMENDED BEARING MATERIAL.
	EXCESSIVE BEARING WEAR	REPLACE HANGER BEARING.
3. PREMATURE TROUGH FAILURE	TROUGH THICKNESS TOO LIGHT	INCREASE TROUGH THICKNESS. USE ABRASION RESISTANT MATERIAL. CONSULT CEMA 350 BOOK TO DETERMINE RECOMMENDED TROUGH THICKNESS.
	SCREW DEFLECTION	CONSULT CEMA 350 BOOK TO DETERMINE PROPER PIPE SIZE AND SCRW LENGTH.
	BENT SCREW	STRAIGHTEN OR REPLACE SCREW.
4. SHAFT HOLE ELONGATION	INSUFFICIENT NUMBER OF COUPLING BOLTS	INCREASE NUMBER OF COUPLING BOLTS
	CONVEYOR SUBJECT TO FREQUENT STOP/START	CEASE FREQUENT STOP/START. INCREASE BEARING CAPACITY OF SHAFT AND/OR INCREASE NUMBER OF COUPLING BOLTS
	FREQUENT OVERLOADS	
5. DRIVE SHAFT BREAKAGE	EXCESSIVE TORQUE	CONSULT CEMA 350 BOOK TO DETERMINE PROPER TORQUE RATING.

SECTION F – TROUBLESHOOTING GUIDE - Continued

PROBLEM	CAUSE	REMEDY
6. MOTOR OVERLOAD	MOTOR UNDERSIZED	CONSULT CEMA 350 BOOK TO DETERMINE PROPER HORSEPOWER REQUIREMENTS.
	UPSET LOADING CONDITION	EMPTY TROUGH, CONTROL FEED AND OPERATE UNDER DESIGN SPECIFICATIONS.
7. TROUGH END BEARING FAILURE	BEARING CONTAMINATION	UPGRADE OR REPLACE SEAL. CHANGE TO OUTBOARD BEARING.
	INSUFFICIENT LUBRICATION	LUBRICATE IN ACCORDANCE WITH MAINTENANCE SECTION OF THIS DOCUMENT.
	IMPROPER SHAFT RUNOUT	CHECK SCREW STRAIGHTNESS AND REPLACE AS NECESSARY.
8. COUPLING SHAFT BREAKAGE	EXCESSIVE TORQUE	CONSULT CEMA 350 BOOK TO DETERMINE PROPER TORQUE RATING.
	INCORRECT ALIGNMENT	REALIGN TROUGH ASSEMBLY AND HANGERS IN ACCORDANCE WITH ASSEMBLY SECTION OF THIS DOCUMENT.
	EXCESSIVE SHAFT WEAR	REPLACE COUPLING SHAFT.

CHART A - BOLT TORQUE GUIDE

GENERAL BOLT TIGHTENING TORQUE (Ft. lbs.)

Bolt Dia. (inches)	Threads Per Inch (UNC)	SAE 2	SAE 5	SAE 8	18-8 & 316 Stainless Steel
1/4	20	5	9	12	6
5/16	18	11	18	25	11
3/8	16	18	31	44	20
7/16	14	28	49	69	29
1/2	13	44	73	105	40
9/16	12	63	108	149	52
5/8	11	96	147	212	86
3/4	10	158	252	351	115
7/8	9	219	389	552	180
1	8	316	589	784	240

All bolted applications should be evaluated to determine optimum tightening torque.

K factor in the formula below is considered an estimate.

The most commonly used K factor is 0.20 for plain finished bolts.

Formula: $T = K \times D \times P$

- 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]

Bolt Torque Guide is for fasteners used to assemble screw conveyors and does not include coupling bolts. Over tightening of coupling bolts could result in failure in tension.

CEMA recommends tightening coupling bolts to 75-percent of the values given in the Bolt Torque Guide to eliminate over tightening of coupling bolts

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CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION

**5672 Strand Court, Suite 2
Naples, Florida 34110-3314**

Tel: 239-514-3441

<http://www.cemanet.org>