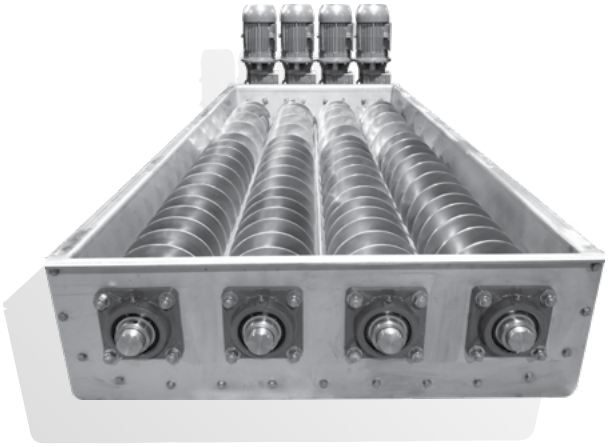
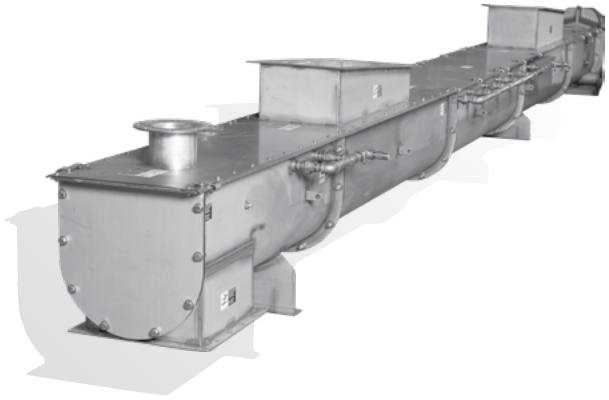
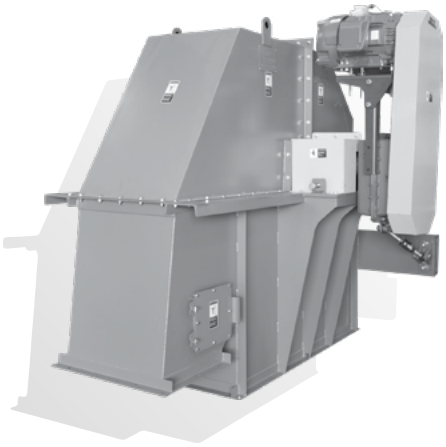
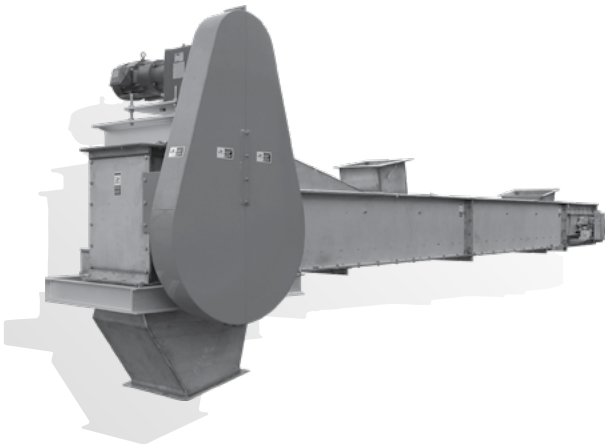
Martin









MATERIAL HANDLING
INSTALLATION, OPERATION AND MAINTENANCE MANUAL

SCREW CONVEYOR
SHAFTLESS SCREW CONVEYOR
BUCKET ELEVATOR
DRAG CONVEYOR
BELT CONVEYOR
CONVEYOR PULLEYS AND IDLERS

FOR ONLINE VERSION
SCAN QR CODE

TABLE OF CONTENTS

CONTACT INFORMATION

Warning & Safety Reminder

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 Martin Sprocket & Gear, Inc., 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 Martin products. These guidelines are in no way intended to replace, supersede or override equipment manufacturer's installation and operating guides. Martin 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 Martin 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. Martin accepts no responsibility for any failure to follow the safety recommendations noted above.** For specific troubleshooting recommendations concerning any product Martin sells, please contact Martin.

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.

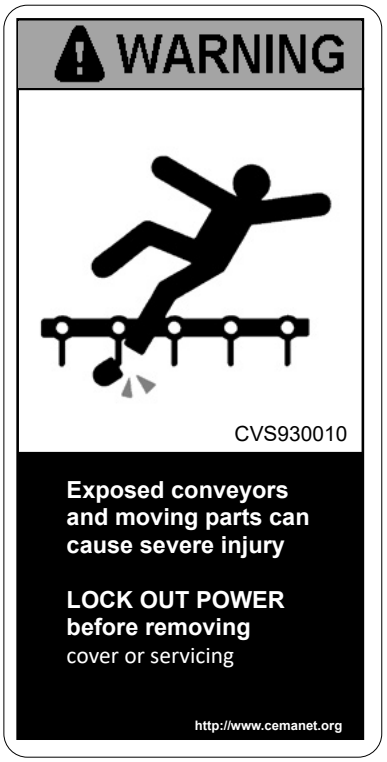
SEE NEXT PAGE FOR SAFETY LABELS

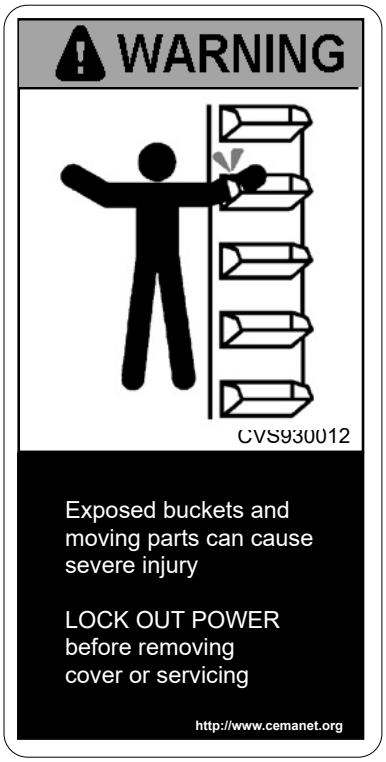
NOTICE: This document is provided by CEMA as a service to the industry in the interest of promoting safety. It is advisory only and it is not a substitute for a thorough safety program. Users should consult with qualified engineers and other safety professionals. CEMA makes no representations or warranties, either expressed or implied, and the users of this document assume full responsibility for the safe design and operation of equipment.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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)

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (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)

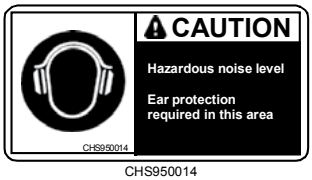
CHR930007
(5"Wide x 2 1/2" High)

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

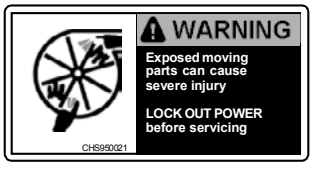
CHS950018
(5"Wide x 2 1/2" High)

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

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

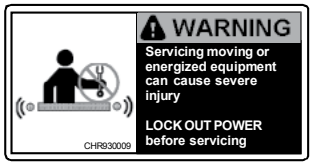


CHS950014
(5"Wide x 2 1/2" High)

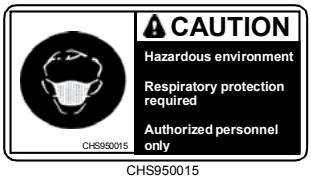


CHS950021
(5"Wide x 2 1/2" High)

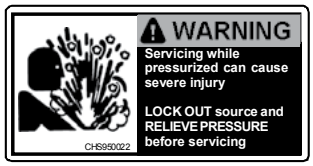
CHR930004
(5" WIDE x 2 1/2" HIGH)



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



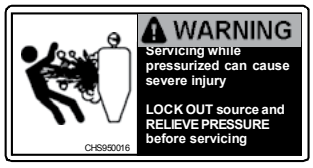
CHS950015
(5"Wide x 2 1/2" High)



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

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

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



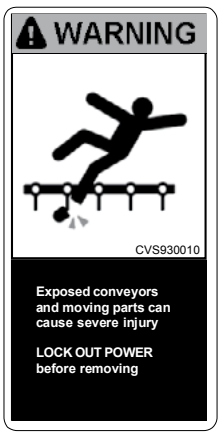
CHS950016
(5"Wide x 2 1/2" High)

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

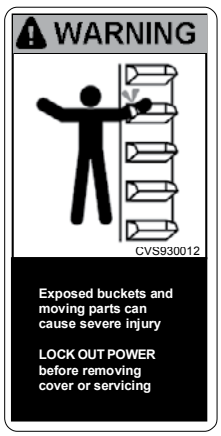
CHR000025
(5"Wide x 2 1/2" High)

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

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

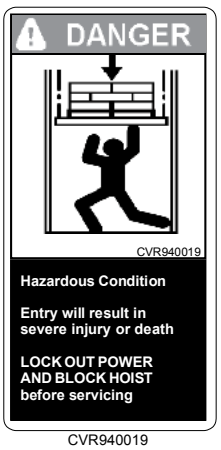


CVS930010
(3" Wide x 6" High)



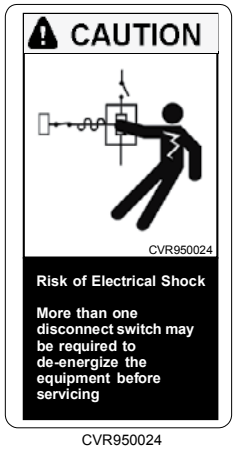
CVS930012
(3" Wide x 6" High)

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

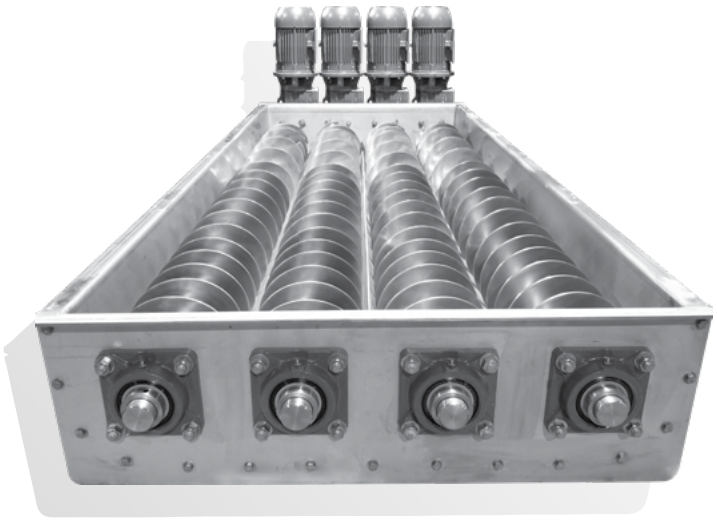
The reason all applications should be evaluated to determine the optimum tightening torque is that the K factor in this formula is always an estimate.

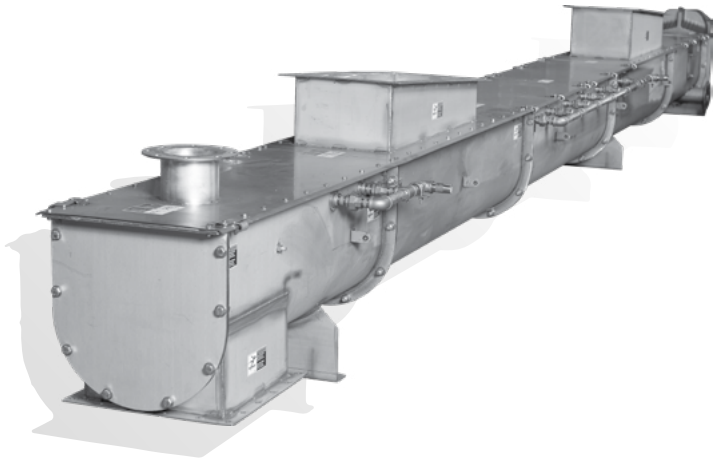
The most commonly used bolting K factors arc 0.20 for plain finished bolts, 0.22 for zinc plated bolts, and 0.10 for waxed or highly lubricated bolts

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]

Martin





SCREW CONVEYOR

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

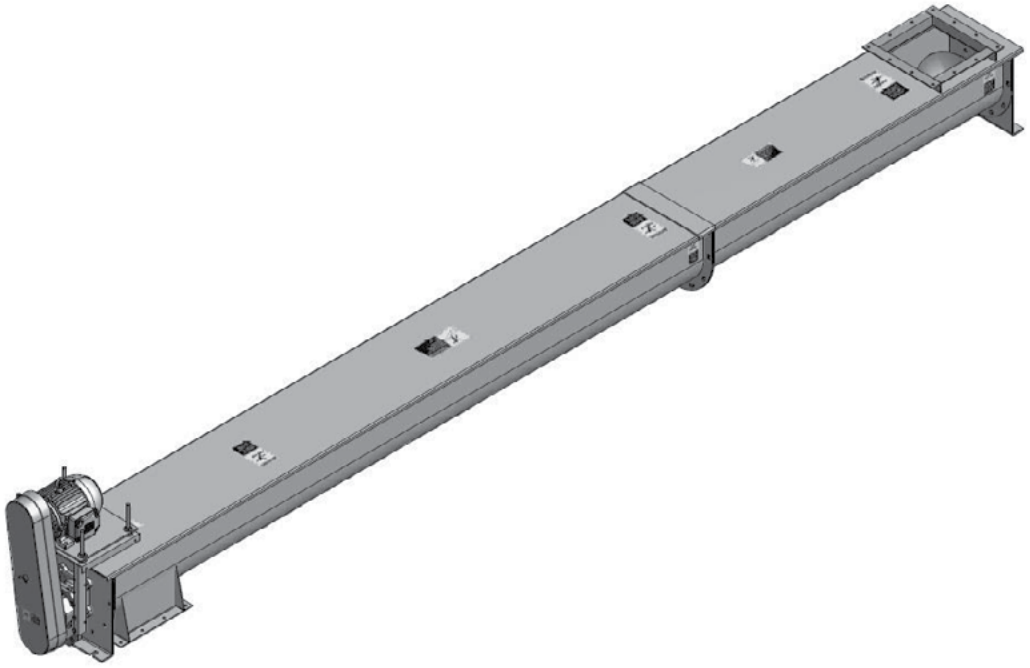
INSTALLATION
OPERATION
MAINTENANCE
INSTRUCTIONS

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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
Copyright © 2018

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

TABLE OF CONTENTS

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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

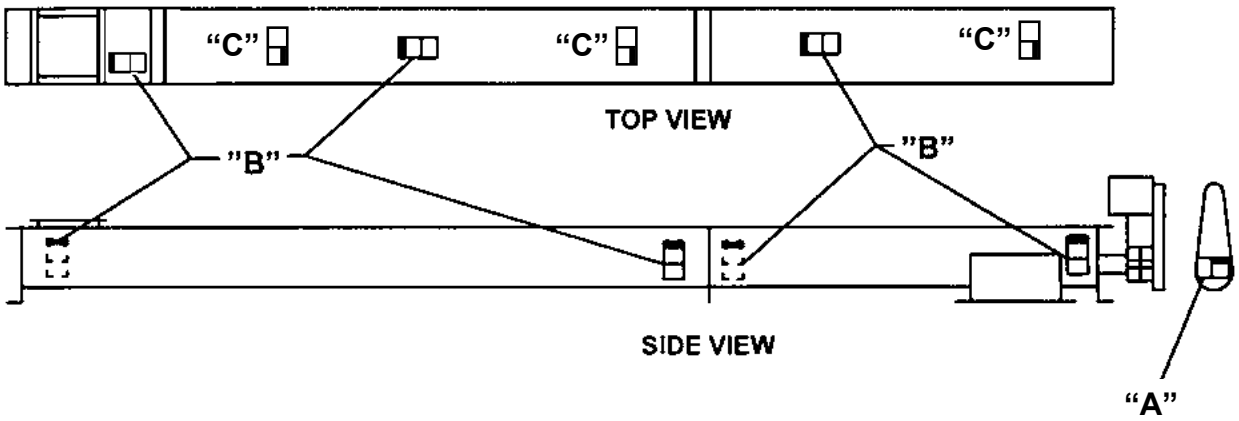
Accidents are usually caused by negligence or carelessness.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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"

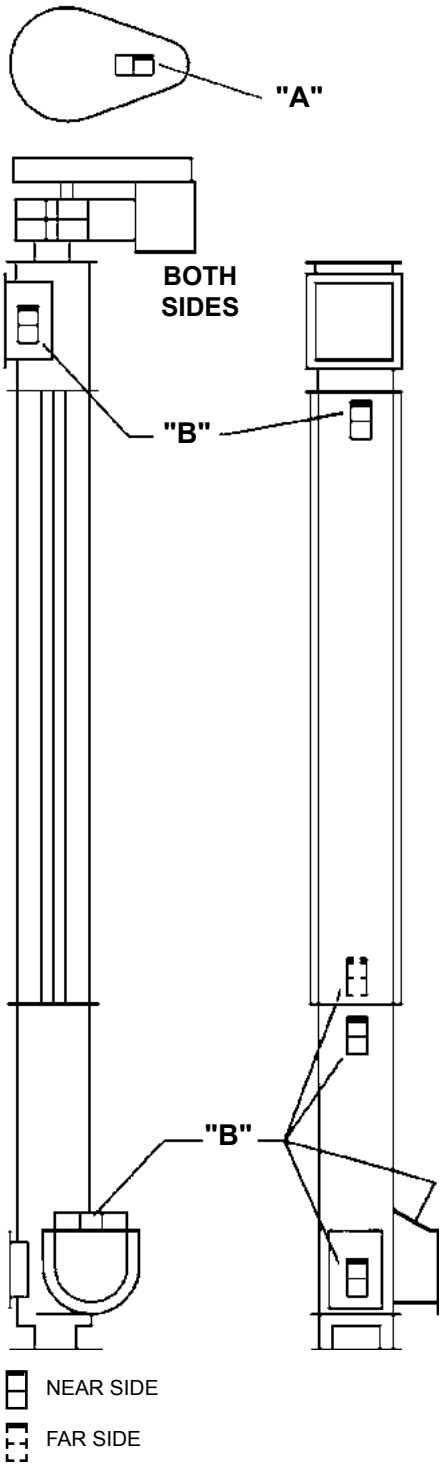
To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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”

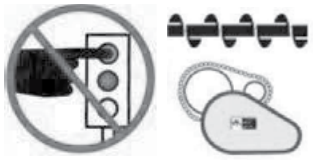
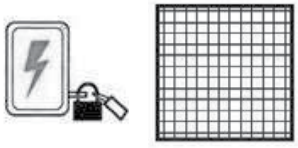
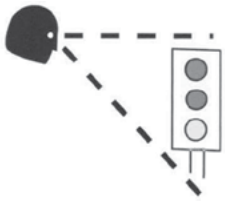
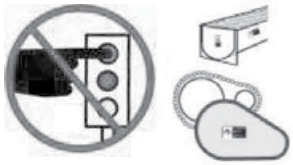
To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

CEMA Screw Conveyor Safety Poster

CEMA
CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION

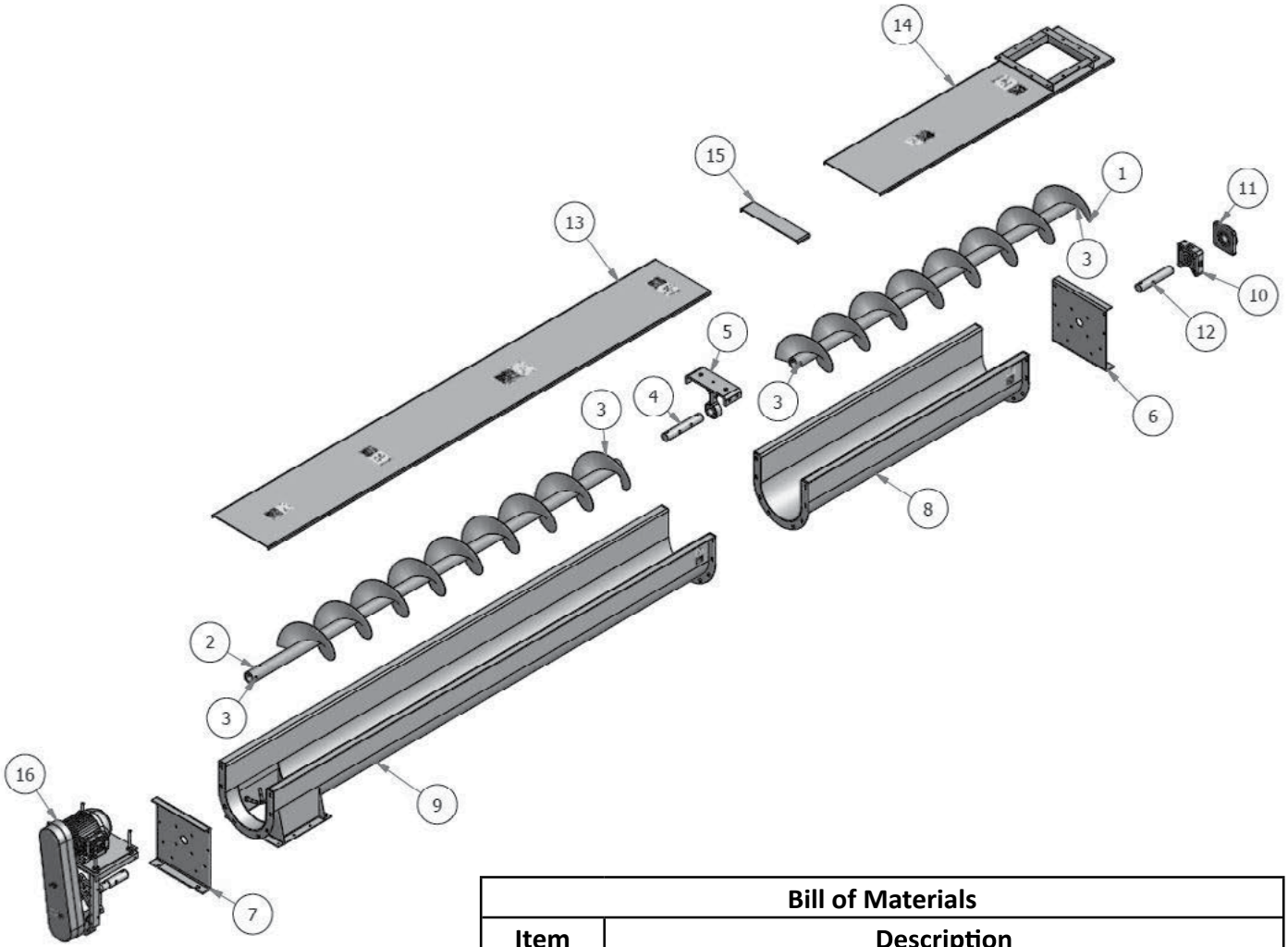
Screw Conveyors

 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

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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

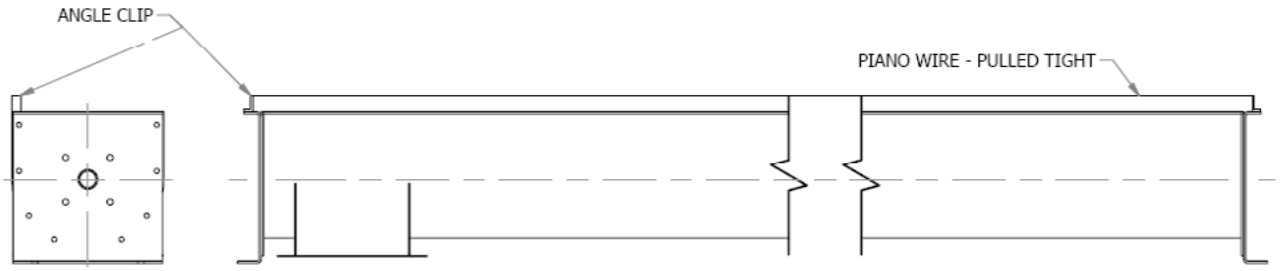
1. Extreme care must be taken to prevent damage when moving assembled conveyors or components.
2. Spreader bars with slings are the recommended support method for lifting.
3. Unsupported span should be no greater than 12 feet.
4. NEVER LIFT A CONVEYOR WITH ONLY ONE SUPPORT POINT.
5. Unusually heavy items 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

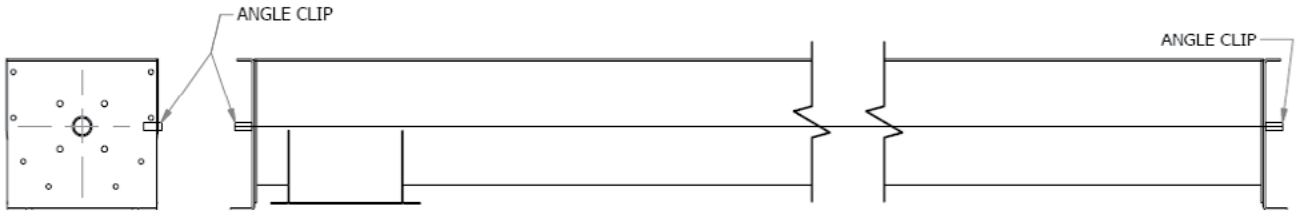
1. The mounting surface for supporting the conveyor must be level and true.
2. Screw conveyor troughs must be assembled straight and true with no distortion.
3. Place troughs in proper sequence with discharge spout properly located.
4. Connect the joints loosely. DO NOT TIGHTEN BOLTS.
5. Assemble each 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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

TROUBLESHOOTING GUIDE

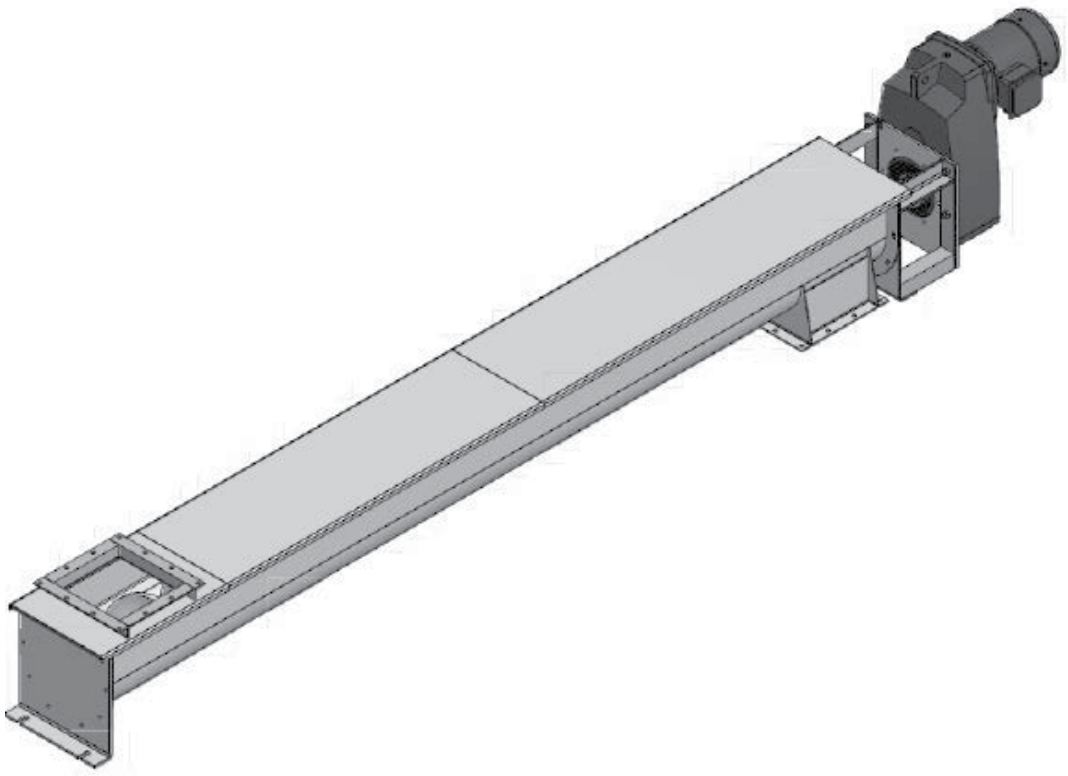
Type of Failure	Probable Cause / Corrective Action
Premature Trough Failure	• **Trough Gauge (thickness) too light.** Increase thickness. Consult Martin catalog materials table / component series for recommendation. • **Screw deflection.** Eliminate excessive deflection. Consult Martin catalog for calculation 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 Martin 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 Martin catalog for proper bearing. • **Improper speed.** For material being conveyed consult Martin catalog for proper speed. • **Improper trough loading.** For material being conveyed consult Martin catalog for proper trough loading.

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

CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION

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

Copyright © 2018

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

TABLE OF CONTENTS

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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

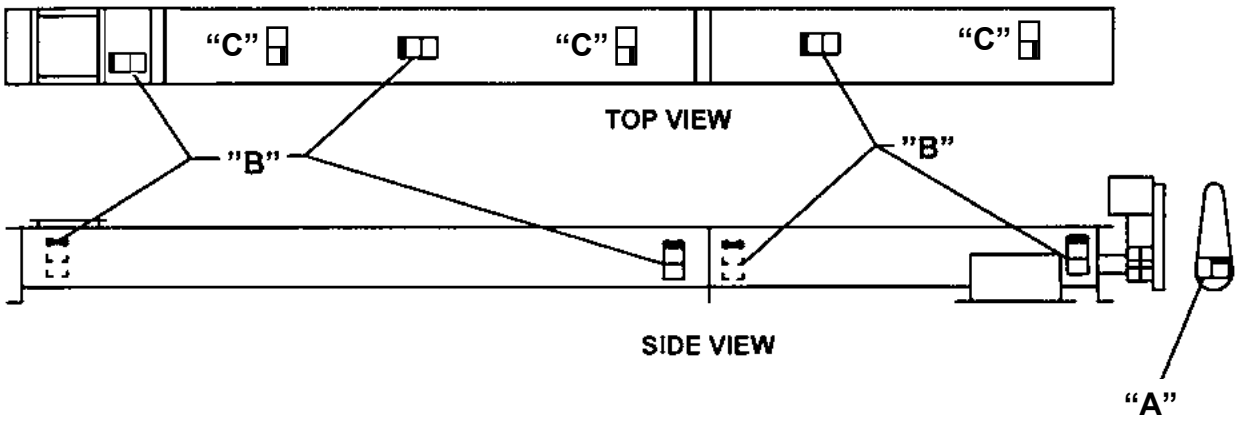
Accidents are usually caused by negligence or carelessness.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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"

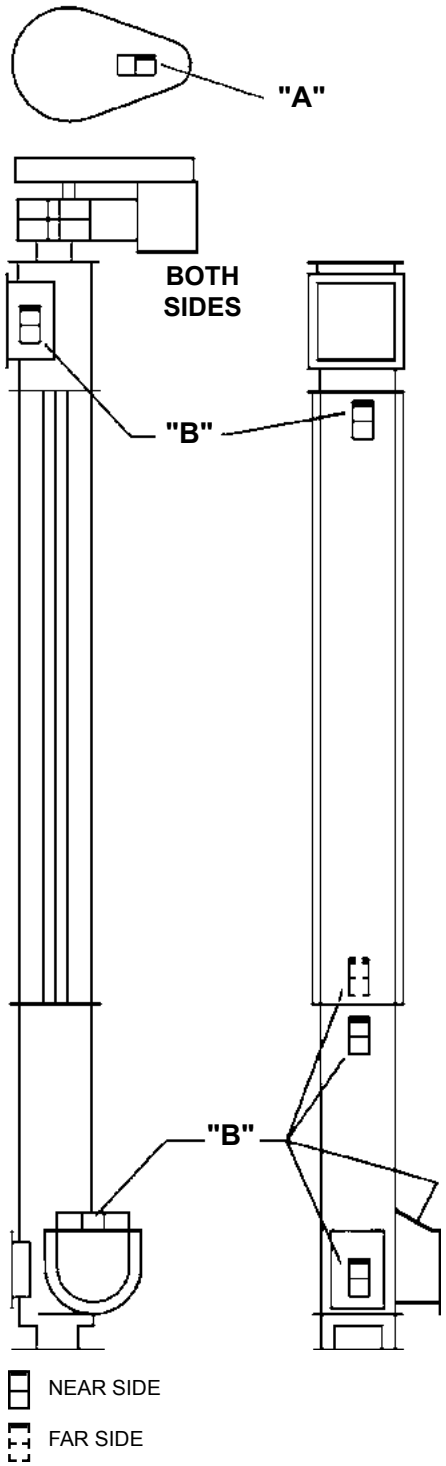
To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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”

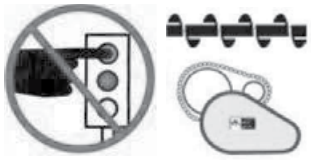
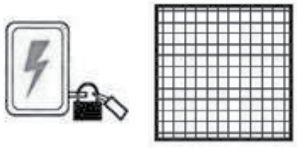
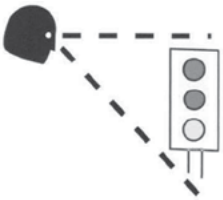
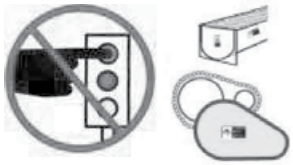
To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

CEMA Screw Conveyor Safety Poster

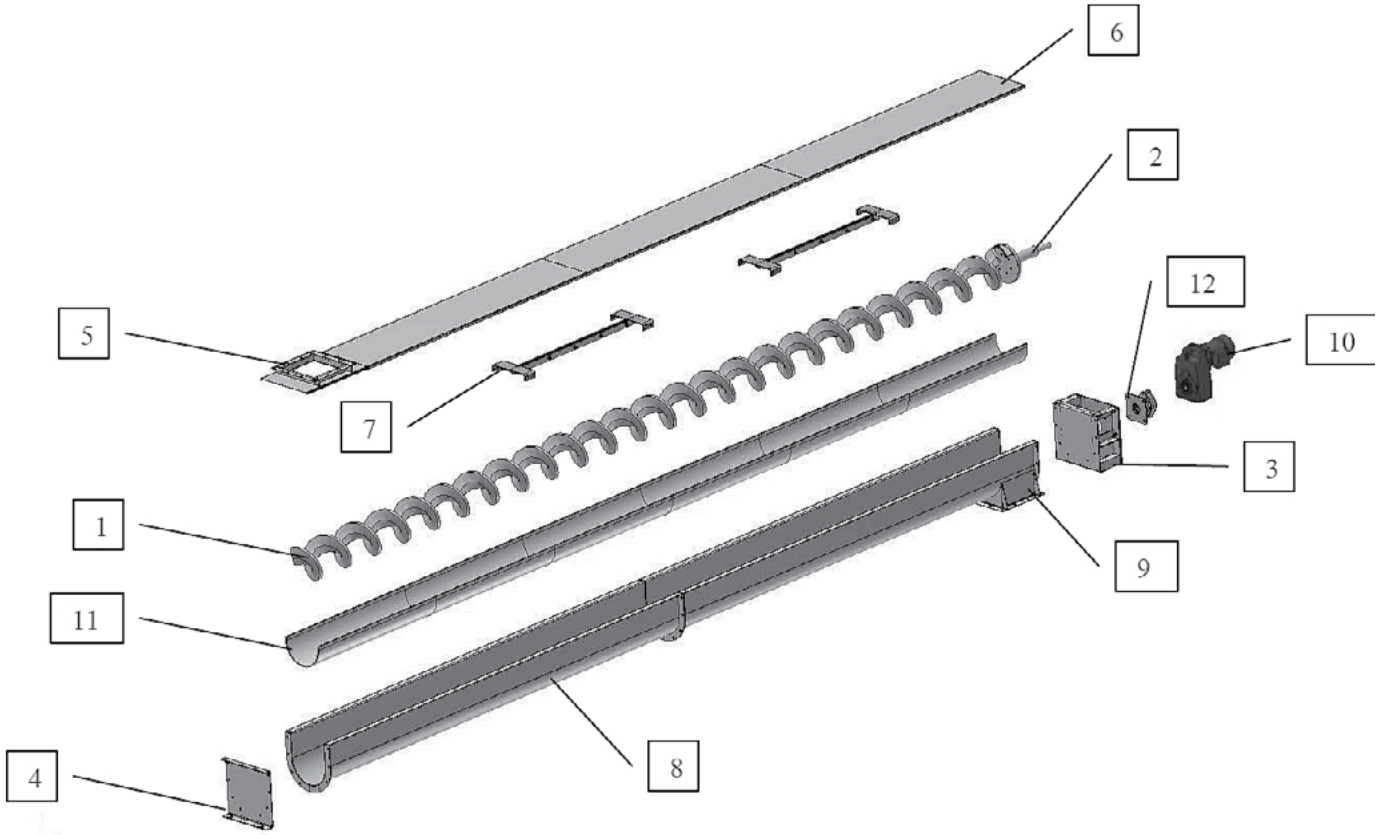
CEMA
CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION

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

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).



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

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

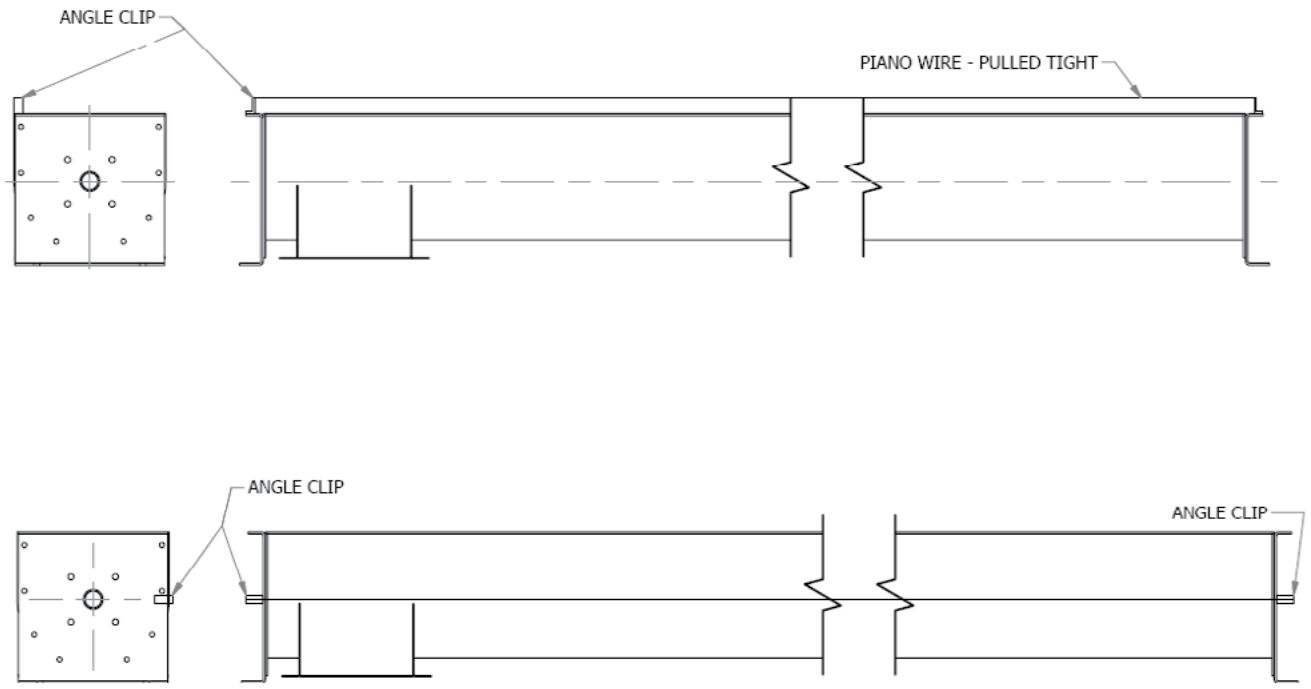


Figure 1. Piano Wire Setup Diagrams

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

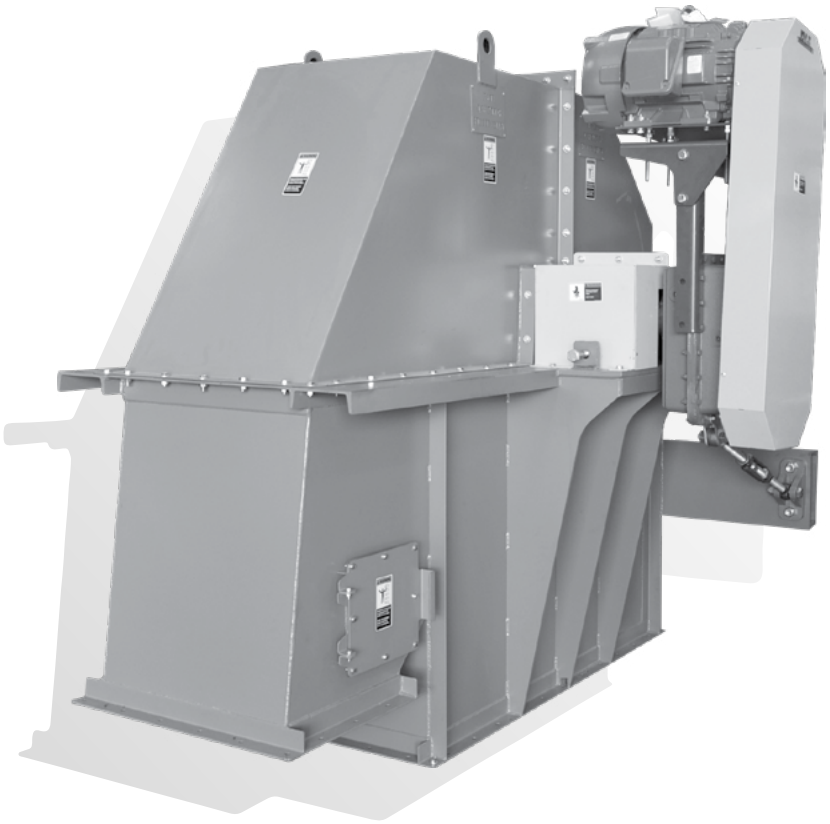
Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

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.

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

Martin



BUCKET ELEVATOR

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

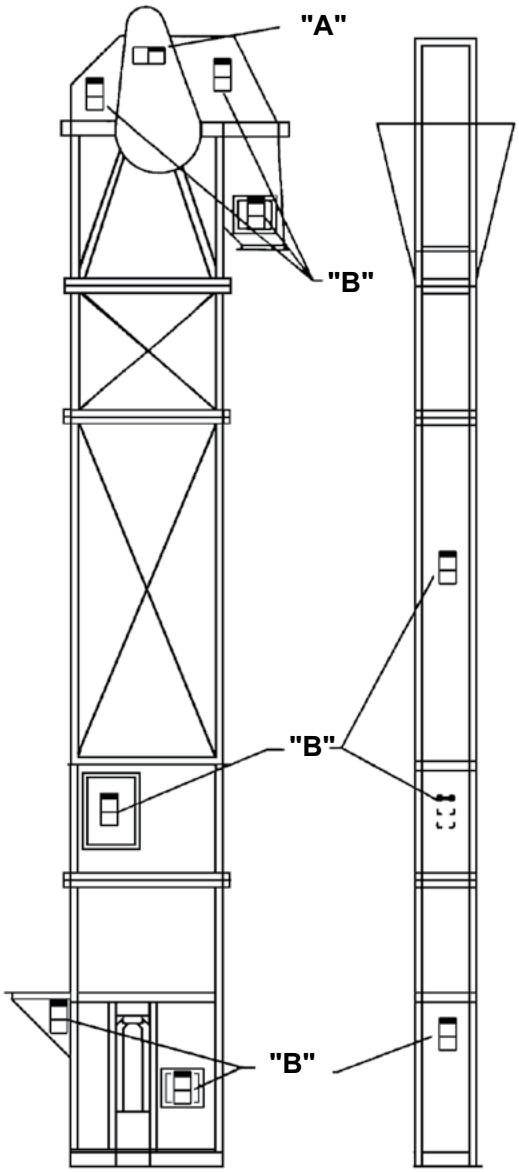
INSTALLATION
OPERATION
MAINTENANCE
INSTRUCTIONS

CEMA Safety Labels Placement Guidelines

Product: Bulk Handling Equipment

Equipment: Bucket Conveyors (**SC-4**)

Use Label “A” on belt guard.
Use Label “B” on each side of intake, all bolted panels and inspections doors, and both sides of split hood.



NEAR SIDE

FAR SIDE

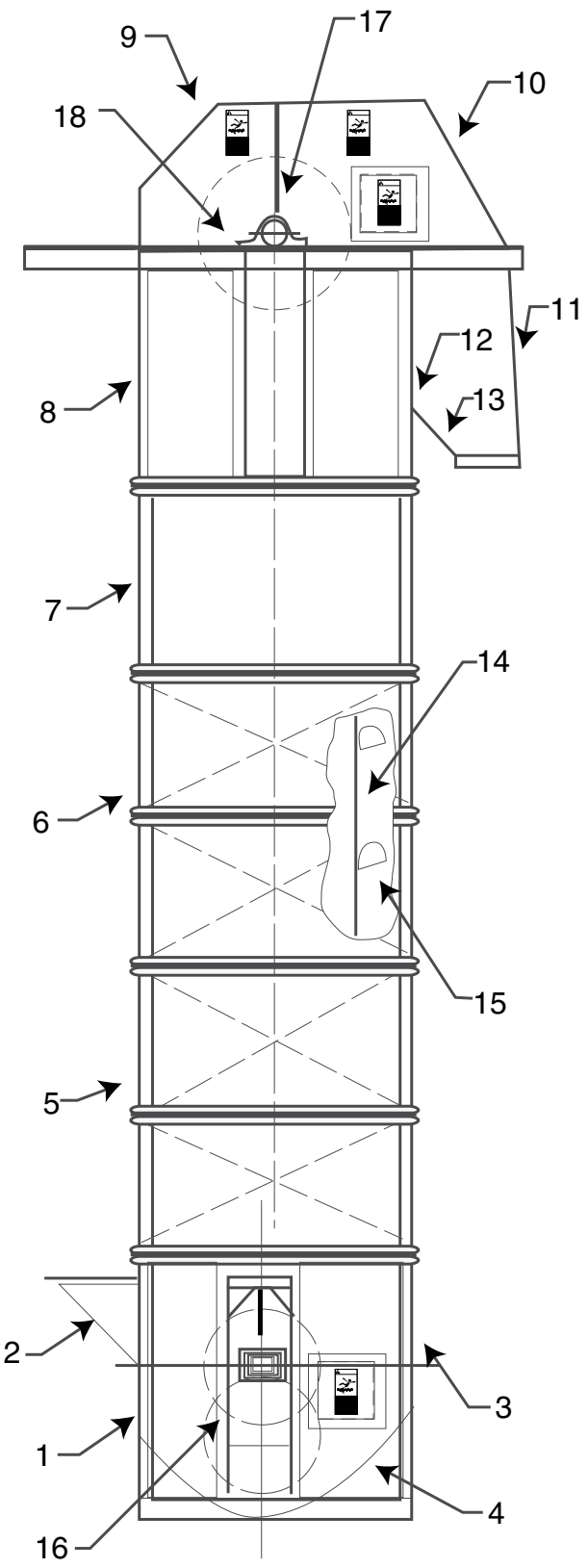
“A”

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 intakes, bolted guards and panels, hoods and doors of bucket conveyors to provide warning against exposing buckets and moving parts while in operation

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).



1. Boot Assembly
2. Inlet Spout
3. Removable Sprocket/Pulley Access Door
4. Curved Boot Plate
5. Intermediate Section. Access Doors Maybe Located At Any Convenient Position
6. Plain Intermediate Section
7. Plain Intermediate Section. Usually the Odd Length Located Under Lower Head Assembly
8. Lower Head Assembly
9. Back Section of Hood
10. Front Section Of Hood
11. Discharge Spout
12. Adjustable Bibb
13. Discharge Spout Liner (Optional item)
14. Elevator Chain or Belt
15. Elevator Buckets
16. Boot Take-up
17. Head Shaft Pillow Blocks
18. Pillow Block Stops (Optional)

NOTE:

It is the purchaser's responsibility to provide a suitable foundation and bolts to receive the elevator.

RECEIVING:

It is important to carefully examine incoming shipments for condition and completeness. Shortages and damage must be reported immediately to the transportation company. DO NOT ATTEMPT TO INSTALL A DAMAGED ELEVATOR OR COMPONENTS.

Normally head and boot sections are factory assembled and include sprockets or pulleys, take-ups, pillow blocks, etc.

Chain or belt, buckets, gaskets, nuts and bolts, special fittings, etc. are usually shipped in separate containers or on pallets/ skids.

Intermediate casings are shipped separately.

CASING (All Elevators)

AA. Insure that anchor bolts are securely placed and conform to the pattern of the boot section mounting holes.

AB. Set boot in place insuring that boot section top flange is level and casing is plumb.

This is accomplished by shimming under the bottom flange. Use shims only next to anchor bolts—not elsewhere along flange. Any gap resulting from shimming is generally sealed with a strong structural grout.

AC. It is essential that the boot be set accurately.

AD. Check drawings to determine correct sequence of erecting intermediate casing. Caulk or gasketing (if provided) should be placed between all casing flanges to provide dust tight sealing.

AE. Normally the erection crew should build a lifting bracket to avoid distortion to fabricated assemblies.

AF. Each and every intermediate section must be level and plumb. It is common to find minor deviations in these types of fabricated assemblies.

Most often they can be corrected by rotating 180° or turning end for end.

If this does not solve an out of level or out of plumb condition it will be necessary to use metal shims and caulk the resulting gap.

When a gap occurs in a corner of the casing, metal shims should be used and should extend a minimum of six inches in both directions. Insure that shims do not project inside of casing.

Each intermediate section must be plumbed to less than 1/8" deviation before proceeding to the next section. **Casings must be braced or anchored to a rigid structure every 20 ft. and not more than 4 ft. below the head section.** If a rigid structure is not available, guy wires may be used with the same spacing.

AG. After all intermediate sections are correctly placed, remove the front and back sections of the hood and set the lower head using the same procedures as with the intermediate sections. Replace hood sections after performing all installation steps H thru PC or PB.

AH. It is critical that the head shaft be exactly level. Minor pillow block shimming may be necessary. Check head shaft pillow block set screws for tightness.

MACHINERY (Chain Type)

BA. Remove boot sprocket access door.

Drop plumb line from head end sprocket to boot sprocket. Insure that sprockets are centered in casing and are exactly in line with each other.

When erecting a double strand chain elevator, check factory drawings for correct sprocket spacing.

Check to insure that the sprocket set screws are tight. Sprockets should be in line when viewed from the narrow side of the casing.

Head and boot shafts are generally offset when viewed from the wide dimension of the casing. Check factory drawings for offset.

Double strand chain elevators commonly will have no offset as identical sprockets are used at the head and boot sections.

BB. Move boot take-up to its uppermost position (head end take-up to lowest position.) Make these adjustments uniformly to both sides at the same time. Many bearings will not accommodate much misalignment. Severe damage to internal bearing parts and seals can occur if this procedure is not followed.

BC. Chain elevators should have the chain installed one length at a time per the manufacturer's instructions. However, depending on the lifting equipment and access to the bucket elevator, the chains may be preassembled and lifted with a crane into the machine per the descriptions below.

Rigging and Lifting Chain

Determine the total weight of the chain segment or assembly prior to lifting so the proper lifting equipment can be acquired.

Refer to the elevator's General Arrangement Drawing to determine the weight of the chain to be lifted.

Always connect rigging around a chain bushing, close to one end of the chain segment or assembly to be lifted. *See Figure 1.*

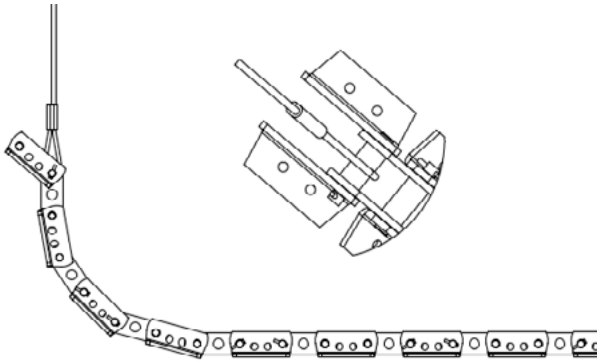


Figure 1. Rigging and Lifting Chain

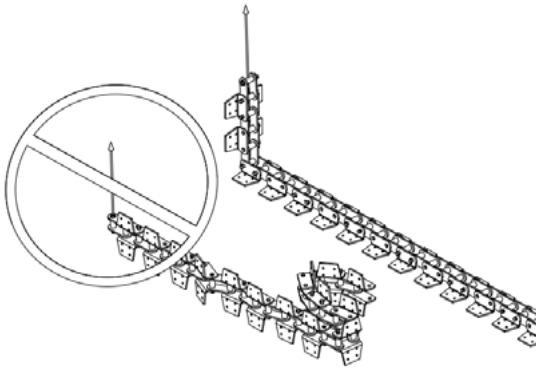
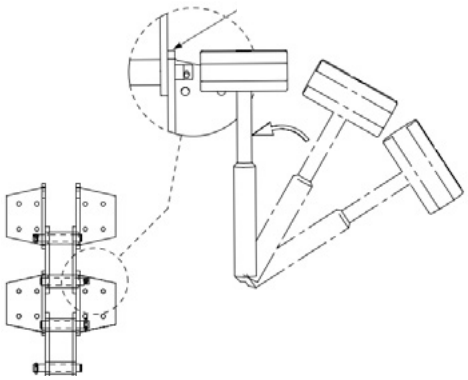


Figure 2. Lifting Chain

STOP	Never install rigging through the chain pin holes or around a chain pin or damage to the components may result.
STOP	Always lift chain with the chain joints parallel to the ground as shown. *See Figure 1.*
STOP	Never lift a chain while it is laying on the sidebars or the chain can become twisted and damaged. *See Figure 2.*
STOP	Failure to loosen the chain and joint will cause erratic chain action and could result in buckets hitting the casing. The chain must flex freely.



STOP	Chain/pins damaged during assembly must be replaced with new chain/pins or chain warranty will be void and chain failure may result.
STOP	Make sure all chain joints flex freely. This is specially important on double strand elevators where the chain attachment on one chain stand must be in alignment and level with the other strand, so the buckets will hang straight/level in the elevator.
STOP	Never back flex a chain and bucket assembly or damage will result.

BD. Only single stranded bucket elevators may allow for installation of pre-assembled chain and buckets per the following instructions and if the right equipment is available on site.

Pre-assembling of Single Strand Chain and Buckets

Under no circumstances should buckets be mounted on the chain prior to being installed in the elevator unless ALL the following criteria are met:

a. Buckets are designed to be attached to a single strand of chain.

b. The chain and bucket assembly can and will be installed at the head end with a crane.

c. Crane capacity is greater than complete chain and bucket assembly.

d. All chain and bucket assemblies can be put together in an area in which the crane can reach and pick them up without dragging.

STOP Do not mount buckets to the chain until the chain has been completely installed and all connections made in the elevator.

STOP Buckets designed to be installed on two strands of chain must never be pre-assembled.

STOP Do not pre-assemble chain and bucket assemblies together until the elevator is ready to have them installed. Store the chain and buckets as specified in the long term storage of the manual until they are needed.

Buckets assembled to the single strands of chain nat the site, prior to it being installed in the elevator, must be assembled accordingly:

1. Always assemble chain and buckets in an area in which the crane operator can easily view and pickup the assemblies without dragging them.
2. Assemble the chain and buckets with the bucket's lip facing down and the chain placed on top of the buckets as shown in Figure 4.

   Never assemble the chain and buckets with the buckets laying on their side or with the chain on the ground and the buckets placed on top.
3. Mount bearing plates on the inside of the buckets when they are supplied or called out on the elevator's General Arrangement Drawings.
4. Use the proper sized mounting hardware and tighten to the proper torque value. For more information on installing Bucket see Bucket Installation.
5. To ease assembly of chain segments it may be necessary to leave the end bucket off of each section. More than one bucket may be left off the very bottom and top assembly of the return and load strand halves of the elevator to ease assembly around the traction wheel(s) or sprocket(s) at the top and bottom of the elevator.
6. Do not make the chain and bucket assemblies longer than what the crane can lift clear over the top of the elevator and any other objects in the cranes swing path.

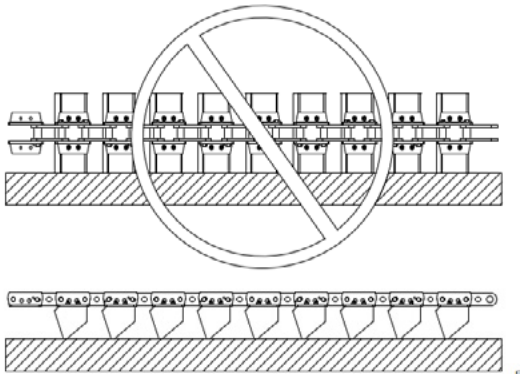


Figure 4. Pre-assembling Chain and Bucket Assemblies

STOP Never attempt to lift a chain and bucket assembly unless the crane capacity is greater than the chain and bucket assembly's total weight.

Always connect rigging around a chain bushing close to one end of the chan and bucket assembly to be lifted. See figure 5.

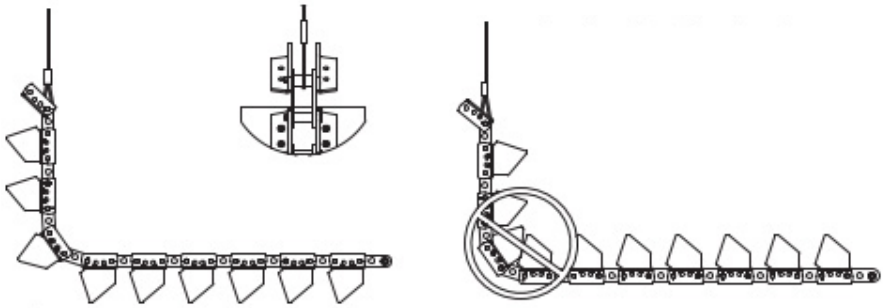


Figure 5. Rigging and Lifting Pre-assembled Chain and Bucket Assemblies

Buckets Mounted on Two Strands of Chain

Buckets mounted on two strands of chain can not be installed until the two strands of chain are aligned. To make sure chain strands are in alignment, at least four buckets must be mounted in the elevator at various places and the level of the buckets checked. All the chain joints in each chain strand must freely flex or chain alignment will not be possible. For information on loosening tight chain joints see Chain Assembly.

BE. It may be necessary to remove up to several links of chain during initial installation.

BF. Adjust take-up accordingly to provide 1/8" to 1/4" gap between the chain barrel and root of boot sprocket tooth. This gap should occur at 6 o'clock on the boot sprocket.

The gap is to accommodate chordal action of the chain.

On long pitch chain this gap can be increased accordingly.

Adjust bibb to provide up to 3/4" to 1" clearance to buckets.

BG. At this point you may find it desirable to "run in" the chain for a period of several hours.

BH. Install buckets using bolts, nuts and lock washers provided. It is a good idea to peen the bolt threads after the buckets are securely in place.

If plastic buckets are being installed, use care to avoid over tightening. Steel backups may be required.

BI. Adjust bibb to provide 3/4" to 1" clearance to buckets. Install upper hood front and back sections.

BJ. After satisfactory alignment and trial operation, weld stops at each end of head shaft pillow blocks to prevent bearing movement. Stops may be of angle iron channels, key stock, etc.

NOTES (Chain Type)

CA. If elevator is equipped with gravity type take-up, use a come along or other means to raise takeup box to the upper most portion when coupling the chain together.

Add weight (concrete or steel stampings) to weigh box as required for smooth operation. Weight must be uniformly distributed in weight box.

Boot sprockets will fully engage the chain, however, insure that upward movement is available to accommodate chordal action of chain. Usually 2 to 3 inches is adequate.

CB. When installing double strand chain elevators be sure to lay out chains and verify equal lengths of parallel strands.

Double strand chains are usually matched and tagged left and right.

CC. On double strand elevators, one boot sprocket is keyed to the shaft, the other sprocket floats between shaft collars. Insure that these collars are tight.

Check shaft collars frequently for tightness. After all plumbing and other adjustments are made, it may be necessary to drill a set screw indent into boot shaft to hold shaft collar position.

CD. During~normal operations, avoid starting and stopping any elevator when loaded with material.

CE. If elevator components are to be stored at the job site for some time prior to erection, insure that components are protected from elements.

It is not advisable to cover elevator components tightly with polyethylene. Condensation will collect and cause corrosion and premature motor failure.

CF. If elevator is to be erected but not used for a long period of time, it is advisable to run the elevator at least one hour per week.

MACHINERY (Belt Type)

DA. Remove boot pulley access door.

Drop a plumb line from head end pulley to boot pulley.

Insure that pulleys are centered in casing and are exactly in line with each other.

Check to insure that the pulley set screws are tight.

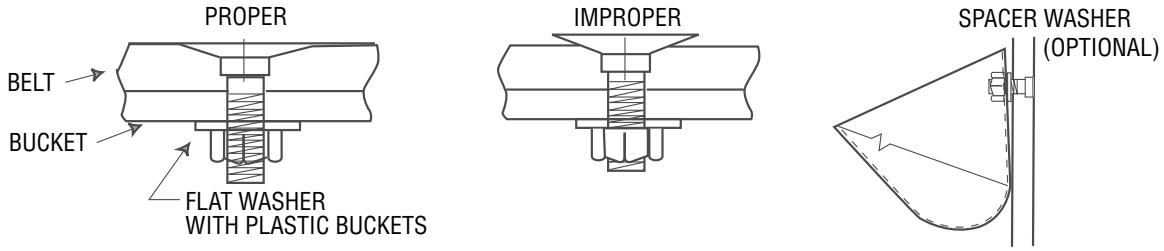
Pulleys should be in line when viewed from the narrow side of the casing.

Head and boot shafts are generally offset when viewed from the wide dimension of the casing.

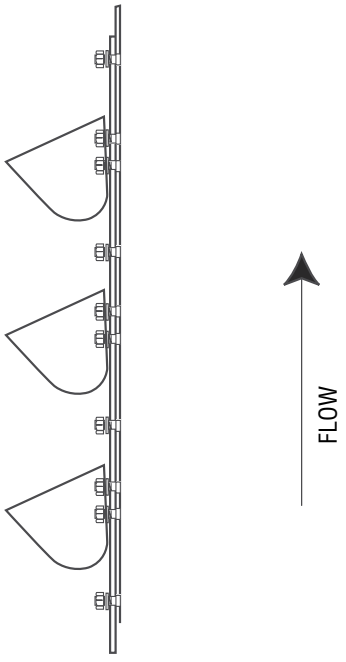
Check factory drawings for offset.

DB. Move boot take-up to its uppermost position (head end take-up to lowest position.) Make these adjustments uniformly to both sides at the same time. Many bearings will not accommodate much misalignment. Severe damage to internal bearing parts and seals can occur if this procedure is not followed.

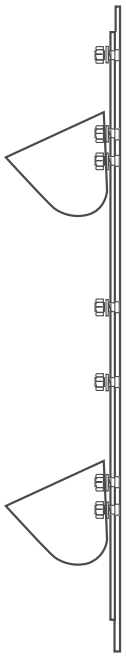
ATTACHING BUCKETS TO ELEVATOR BELTS



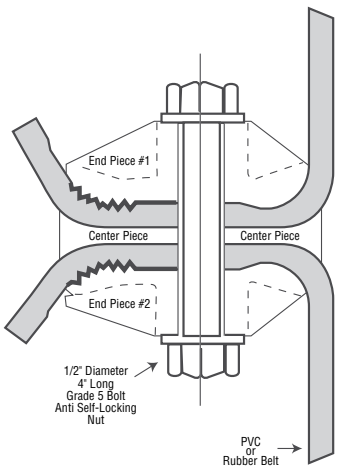
If rubber covered belt with unequal thickness covers is used, the thicker cover should be installed on the pulley side.



LAP JOINT



BUTT JOINT



CLAMP SPLICE

DC. It is recommended, especially in cool environments, that the belt be draped over the head pulley and allowed to hang for at least 24 hours. This will relieve stresses resulting from being rolled up and tend to achieve initial stretch common to belting.

DD. Select the type of splice to be used from illustrations above.

DE. Clamp belt several feet from both ends using clamping angle irons and pull ends until a snug tension is achieved. Splice belt by installing elevator bolts, nuts, and washers. Often it is desirable to add one or more rows of additional bolt holes between buckets in the splice area. This is accomplished by drilling the holes while the belting is clamped in the pretensioned condition. If clamp splice is used follow instructions supplied with clamps.

DF. Remove belt clamps and adjust take-ups uniformly to both sides to remove any slack in the belt. Use caution to avoid over tightening the belt as this can cause premature failure of: Belting, shafts, bearings, etc. At this point it is advisable to “run in” the belt for a period of several hours to observe belt tracking and any further initial stretch.

The responsibility to do the splice correctly lies with the installer.

DG. Install buckets using bolts, nuts and lock washers provided. It is a good idea to peen the bolt threads after the buckets are securely in place.

If plastic buckets are being installed, use care to avoid over tightening. Large diameter steel flat washers or fender washers are frequently used with plastic buckets.

DH. Adjust bibb to provide up to 3/4” to 1” clearance to buckets. Install upper hood front and back section.

DI. After satisfactory alignment and trial operation, weld stops at each end of head shaft pillow blocks to prevent bearing movement. Stops can be angle iron, channels, keystock material, etc.

NOTES (Belt Type)

EA. If elevator is equipped with gravity take-up, use a come-along or other means to raise take- up box to the upper most position when splicing the belt.

Add weight (concrete or steel stampings) to weight box as required for smooth operation. Weight must be uniformly distributed in weight box and sufficient to remove slack from belt.

EB. During normal operations, avoid starting and stopping any elevator when loaded with material.

EC. If elevator components are to be stored at the job site for a period of time prior to erection, insure that components are protected from the elements.

It is not advisable to cover elevator components tightly with polyethylene. Condensation will collect and cause corrosion to elevator components and possibly premature motor failure due to moisture in the windings.

ED. If elevator is to be erected but not used for a long period of time, it is least one hour per week.

DRIVES (All Types)

If drive is not factory assembled, install at this time.

1. Gearmotor Drive

Mount driven sprocket securely to head shaft.

Fill reducer with proper lubricant and install driver sprocket. Recommended oil is generally indicated on the reducer name tags.

Set reducer in position and line up drive sprockets.

Shorten center distance by adjusting movable base.

Install chain and connecting links.

Adjust slide base to a point where some sag is noted on the bottom strand of chain when the top strand is tight.

Lock base of reducer into position. Check all mounting bolts for tightness.

Install chain guard and add lubricant if oil bath guard is furnished.

If possible, rotate gearmotor by hand to determine whether the back stop is correctly installed. (See reducer manufacturers instructions for additional details.)

Other types of backstops are frequently used. (See manufacturers instructions.)

2. Shaft Mounted Gear Reducers

Assemble back stop to reducer. (See manufacturers instructions.) Assemble reducer to head shaft using bushings and keys if provided.

3. Backstop / Torque Arm

Removal of backstops or torque arms may cause unexpected machine movement. Remove or block all external loads before servicing the unit. Failure to observe these precautions could result in bodily injury.

- ☐ Bolt motor in place and install driver and driven sheaves.
- ☐ Check for alignment.
- ☐ Attach turnbuckle and turnbuckle mounting bracket.
- ☐ Install V-belts, tighten turnbuckle and lock in place with lock nuts.
- ☐ Add oil to reducer. Recommended oil is generally indicated on the reducer name tag.
- ☐ Install V-belt drive guard.
- ☐ Connect electric motor.

START UP (All Types)

Check to insure elevator is free of foreign materials before connecting power.

Check to insure all guards, covers, safety devices and controls are in place and operating correctly.

Initial start up of elevator should commence with several short jogs gradually lengthening in duration without material. Check take-up adjustment after 8 hours. Retighten all fasteners. Check and realign sprockets/pulleys as necessary. Gradually begin feeding material to the elevator. Increase feed rate slowly until reaching design capacity. Empty elevator. **LOCK OUT/TAG OUT ALL POWER.** Check for loose fasteners. Check alignment of sprockets/pulleys. **Elevator should be checked for loose fasteners and alignment at least once a month.**

OPERATION (Chain Type)

When elevator is new it is common to have an occasional tight chain joint. This will cause some vibration but will eventually loosen.

If plastic buckets are used in conjunction with metal breaker buckets, it is normal to experience some pulsation. Characteristics of the material will affect the degree of pulsation. Pulsation is caused by the difference in bucket projection.

Do not intermix old chain and new chain in parallel strands. Always order matched lengths.

Primary to satisfactory elevator operation is uniform material feed rates — not surge loading and excessive boot flooding.

When consulting the factory regarding a specific elevator, refer to the purchase order number, year of manufacture if known, and equipment number if appropriate.

Regular inspection and maintenance will insure uninterrupted and satisfactory elevator performance.

OPERATION (Belt Type)

If plastic buckets are used in conjunction with metal breaker buckets, it is normal to experience some pulsation. Characteristics of the material will affect the degree of pulsation. Pulsation is caused by the difference in bucket projection.

Primary to satisfactory elevator operation is uniform material feed rates—not surge loading and excessive boot flooding.

Regular inspection and maintenance will insure uninterrupted and satisfactory elevator performance.

When consulting the factory regarding a specific elevator, refer to the purchase order number, year of manufacture if known, and equipment number if appropriate.

Periodic inspections must be performed to determine the wear rate of all chains, buckets, belts and bearings. During these inspections the alignment of sprockets, pulleys and all drive components shall be checked. Retightening of fasteners and checks to insure guards, covers, gratings, controls, and safety devices are in place, secure, and operating correctly.

Keep a good supply of spare parts. When ordering, refer to our Service Manual and furnish the part identification as well as original order number.

WARNING: Removal of backstop may cause unexpected machinery movement as indicated by note 17 of "Safety"
If backstop is installed as part of shaft mount reducer removal of torque arm may also cause unexpected machinery movement.

Extended Shutdown / Storage

If the conveyors are to have an extended shutdown or storage (beyond one month) the following should be performed:

1) Insure all foreign material is removed from the conveyor and surface coatings are in good order.
2) All bearings and drives are lubricated and protected per manufacturer's instructions.
3) The conveyor is protected from weather, moisture and extreme temperatures. Do not use plastic or other coverings which promote condensation under the covering.
4) All exposed metal surfaces are coated with a rust preventative oil that is applied per instructions.
5) Prior to start-up, installation and operation instructions contained in this manual must be performed.

Maintenance Checklist:

Buckets:

- ☐ Check buckets periodically for bucket damage and loose bolts.

  All damaged buckets should be replaced or properly repaired.

Discharge Bibb:

- ☐ Check adjustable discharge bib for wear after a month of operation and replace discharge bibb if worn. Inspect discharge bibb on a regular basis.

Sprockets, Traction Wheels

- ☐ Check sprockets and traction wheels for excessive, uneven, or unusual wear.

  Replace sprockets or traction wheels if worn. On segmental sprockets, check and re-torque bolts on the replacement segments on both the head and boot shafts.

Chain, Belt

- ☐ Check the take-up for bucket clearance in the bottom of the boot housing.

  To add clearance, remove (1) two-link section, as required.
- ☐ Inspect chain/belt regularly. Consult manufacturer for wear guidelines

Important !!

Correct all deficiencies before continuing/restarting operation of any machinery.

Caution:

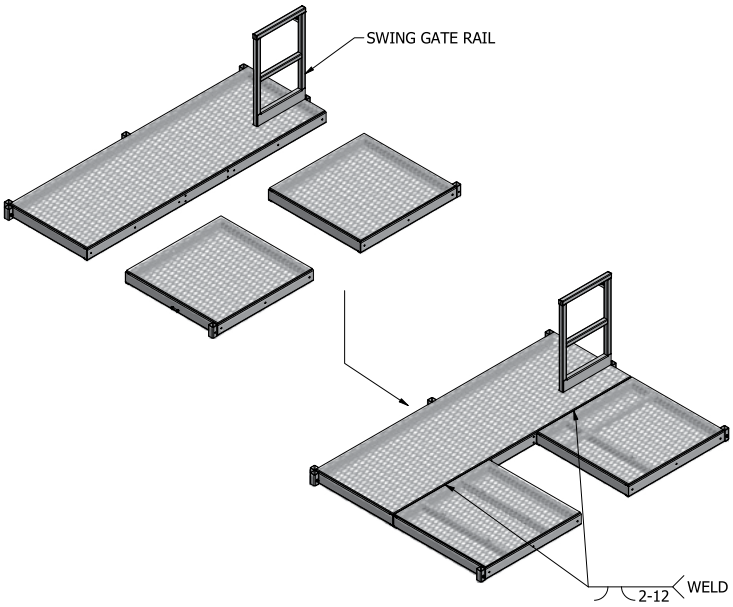
Practice good housekeeping and use proper **LOCK OUT/TAG OUT ALL POWER** procedures.

Keep the areas around loading, discharge, drive and control points, clean and free from obstructions to maintain a safe environment for all personnel.

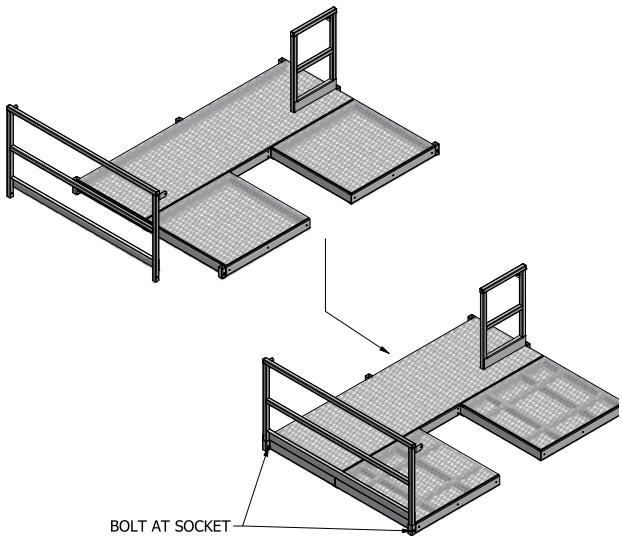
PROBLEM	POSSIBLE CAUSE
Elevator Vibrates	1. Foreign matter in boot 2. Excessively tight chain/belt 3. Excessively loose chain/belt 4. Loose or broken buckets 5. Buckets hitting bibb plate 6. Misaligned elevator head and boot shaft 7. Elevator is not adequately braced. See para. F., installation 8. Chain/belt hitting inside of casing when casing is not plumb
Elevator Will Not Start	1. Obstruction in boot 2. Electrical problem 3. Backstop incorrectly installed 4. Broken V-Belts or drive chains 5. Reducer failure 6. Boot excessively plugged with material 7. Excessively tight chain/belt
Pillow Blocks Get Hot	1. Over lubrication 2. Under lubrication 3. Excessive chain/belt tension 4. Misalignment of head shaft pillow blocks 5. Misalignment between head and boot shaft
Elevator Not Discharging Properly	1. Speed incorrect - consult factory 2. Air cushion - vent compartment being discharged into 3. Light fluffy materials - reduce speed up to 15% 4. Certain materials may require perforated buckets* 5. Some materials may be affected by static electricity*

*Consult Factory

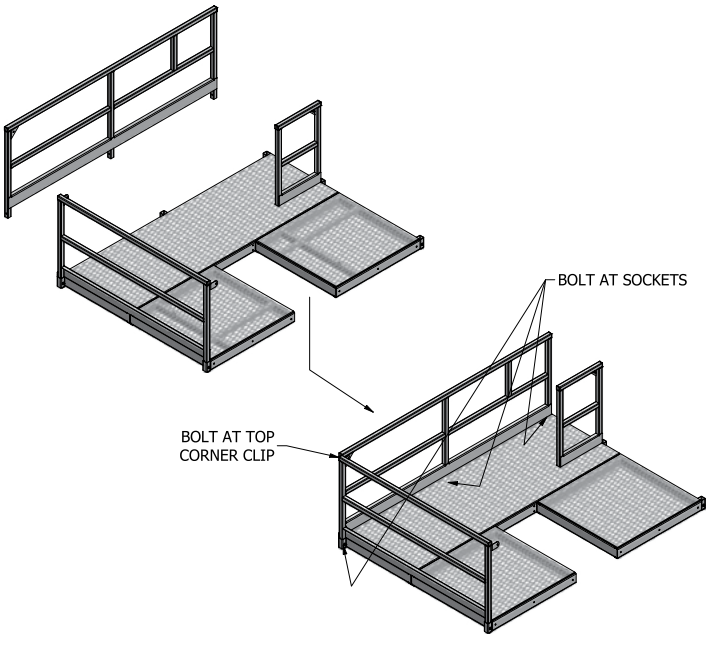
WORK PLATFORM FIELD ASSEMBLY REFERENCE



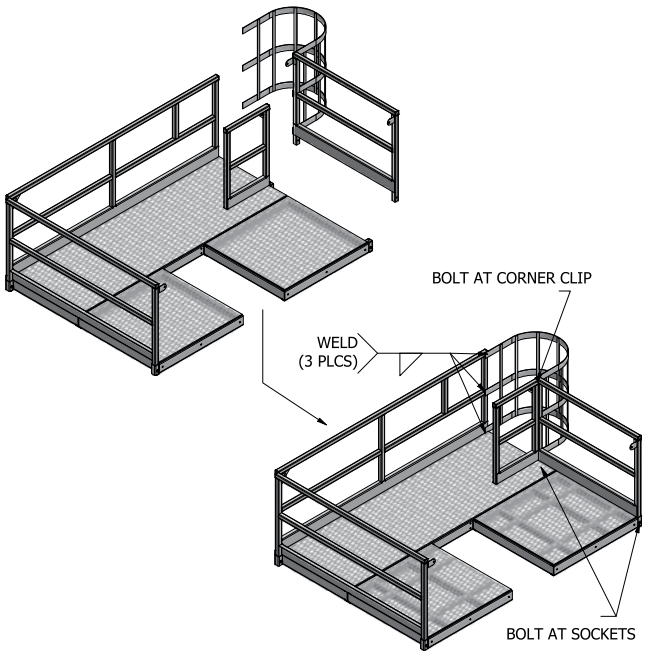
1. IF FRAME SHIPPED IN LOOSE COMPONENTS, LAYOUT AS SHOWN IN VIEW. BOLT AND SKIP WELD FRAME SECTION TOGETHER.



2. FIT SIDE HAND RAIL INTO FRAME SOCKETS & BOLT TOGETHER.

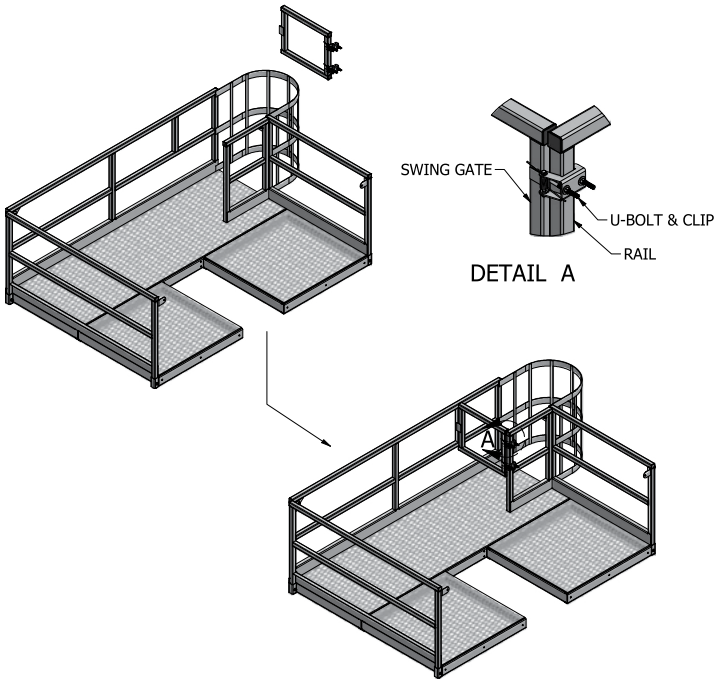


3. FIT BACK HAND RAIL INTO FRAME SOCKETS & BOLT TOGETHER. BOLT TOP CORNER CLIP TO SIDE RAIL TOP CORNER CLIP.



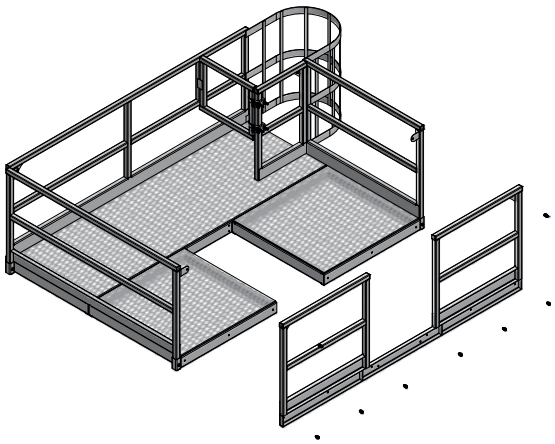
4. FIT SIDE RAIL W/ CAGE INTO FRAME SOCKETS & BOLT TOGETHER. BOLT TOP CORNER CLIP TO SWING GATE RAIL TOP CORNER CLIP. CAGE WILL BE CONTINUOUSLY WELDED TO BACK HAND RAIL.

WORK PLATFORM FIELD ASSEMBLY REFERENCE

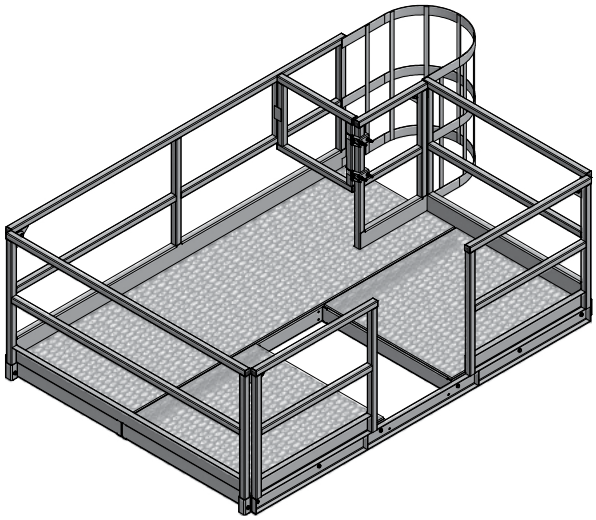


5. INSTALL SWING GATE BETWEEN RAILS. USE PROVIDED U-BOLTS & CLIPS TO FIT AND SECURE AROUND RAIL AS SHOWN.

FOR SAFETY PRECAUTION, SWING GATE SHOULD OPEN INTO THE PLATFORM AND NOT TOWARDS THE CAGE



6. FIT UP & INSTALL PLATFORM ON BUCKET ELEVATOR
INSTALL FRONT HANDRAIL AFTER PLATFORM HAS BEEN FITTED TO BUCKET ELEVATOR

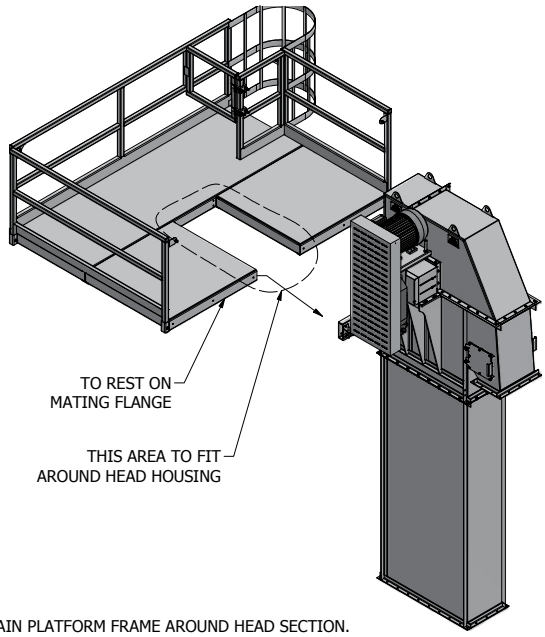


COMPLETE ASSEMBLED PLATFORM

ASSEMBLY NOTES:

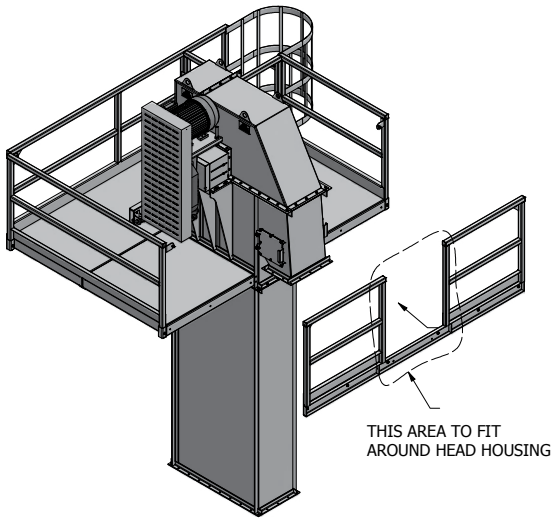
1. FRONT HAND RAIL TO BE INSTALLED AFTER PLATFORM IS FITTED TO BUCKET ELEVATOR; (SEE MARTIN WP-EZ-FLD_INSTALL DRAWING)
2. FRAME SECTIONS & FRONT HAND RAIL USE USE 1/2"-13 X .25 LG. HEX HEAD BOLTS W/ (2) WASHERS & (1) HEX NUT.
3. FRAME SOCKETS USE 1/2"-13 X 3.25 LG. HEX HEAD BOLTS W/ (2) WASHERS & (1) HEX NUT.
4. TOP CORNER CLIPS USE 1/2"-13 X 1.5 LG. HEX HEAD BOLTS W/ (2) WASHERS & (1) HEX NUT.
5. MARTIN TO PROVIDE ALL HARDWARE (BOLTS, NUTS, WASHERS) NECESSARY TO COMPLETELY ASSEMBLE PLATFORM.
6. MARTIN DOES NOT PROVIDE WELD MATERIALS.
7. CAGE & SWING GATE LOCATIONS ARE SUBJECT TO CHANGE DEPENDING ON CUSTOMER SPECIFICATIONS; VIEWS WITH CAGE ARE FOR ASSEMBLY REFERENCE ONLY

WORK PLATFORM FIELD INSTALLATION REFERENCE

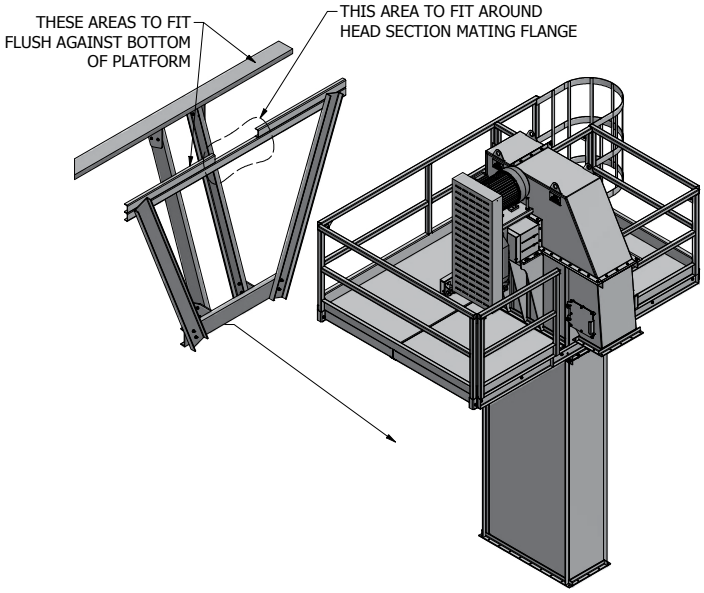


1. FIT UP MAIN PLATFORM FRAME AROUND HEAD SECTION.
   PLATFORM WILL REST ON HEAD SECTION MATING FLANGE.
   MATCH DRILL & BOLT TO HEAD SECTION ON INLET SIDE.

RECOMMENDED: ASSEMBLE PLATFORM FRAME ON
GROUND BEFORE FIT UP
(SEE DRAWING WP-EZ-FLD-ASSY)

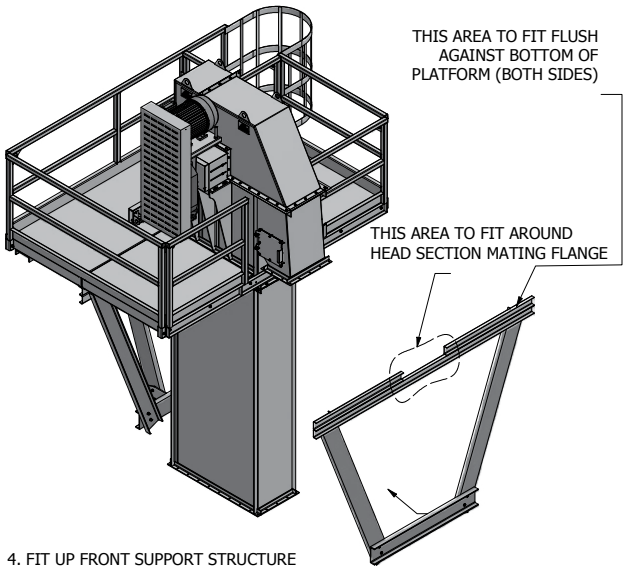


2. FIT UP FRONT HAND RAIL.
   BOLT TO HEAD SECTION ON DISCHARGE SIDE & MAIN PLATFORM FRAME.
   BOLT TO TOP CLIPS ON SIDE RAILS.
   SKIP WELD TO MAIN PLATFORM FRAME.



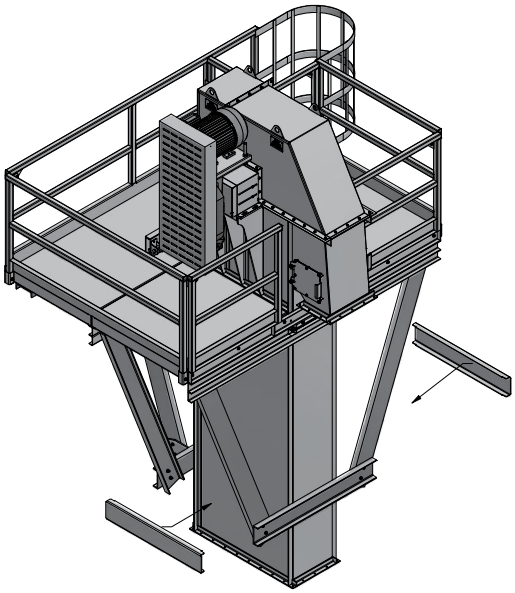
3. FIT UP REAR SUPPORT STRUCTURE.
   TOP OF SUPPORTS TO CONTACT UNDERSIDE OF PLATFORM FRAME.
   SKIP WELD TO ELEVATOR CASING WHERE ABLE

RECOMMENDED: ASSEMBLE INLET SIDE SUPPORT STRUCTURE
SECTION ON GROUND BEFORE FIT UP

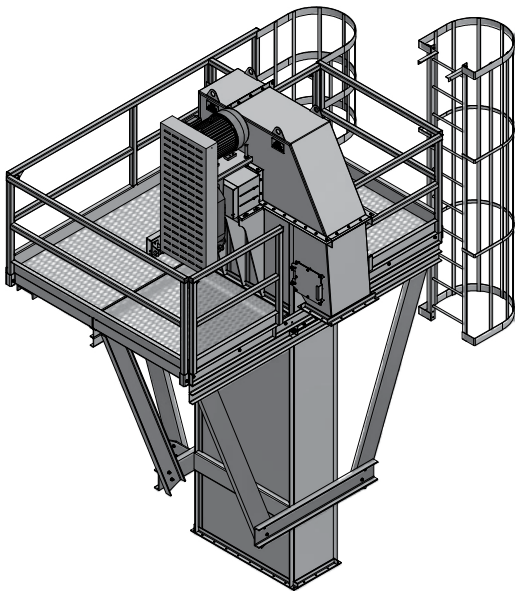


4. FIT UP FRONT SUPPORT STRUCTURE
   SKIP WELD TO ELEVATOR CASING WHERE ABLE

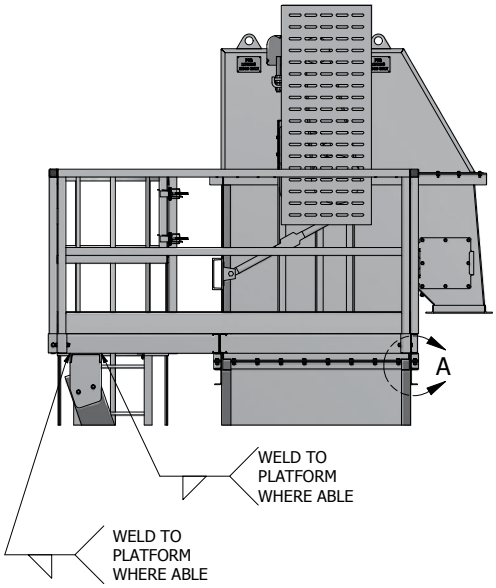
RECOMMENDED: ASSEMBLE DISCHARGE SIDE SUPPORT STRUCTURE
SECTION ON GROUND BEFORE FIT UP

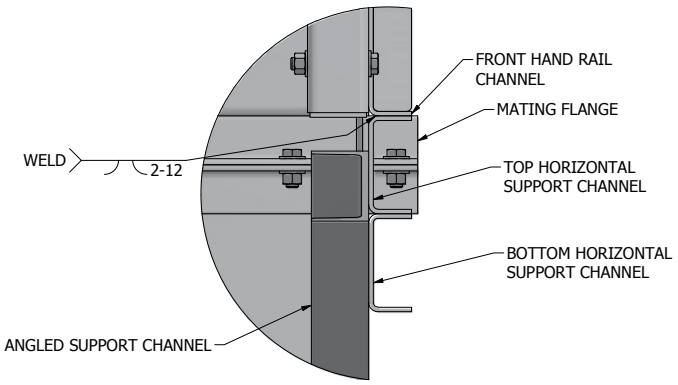


5. FIT UP & WELD SIDE COLLARS, (ONE ON EACH SIDE).
COLLARS TO FIT BETWEEN SUPPORT STRUCTURE
BOTTOM CHANNEL, SNUG AGAINST ELEVATOR CASING.



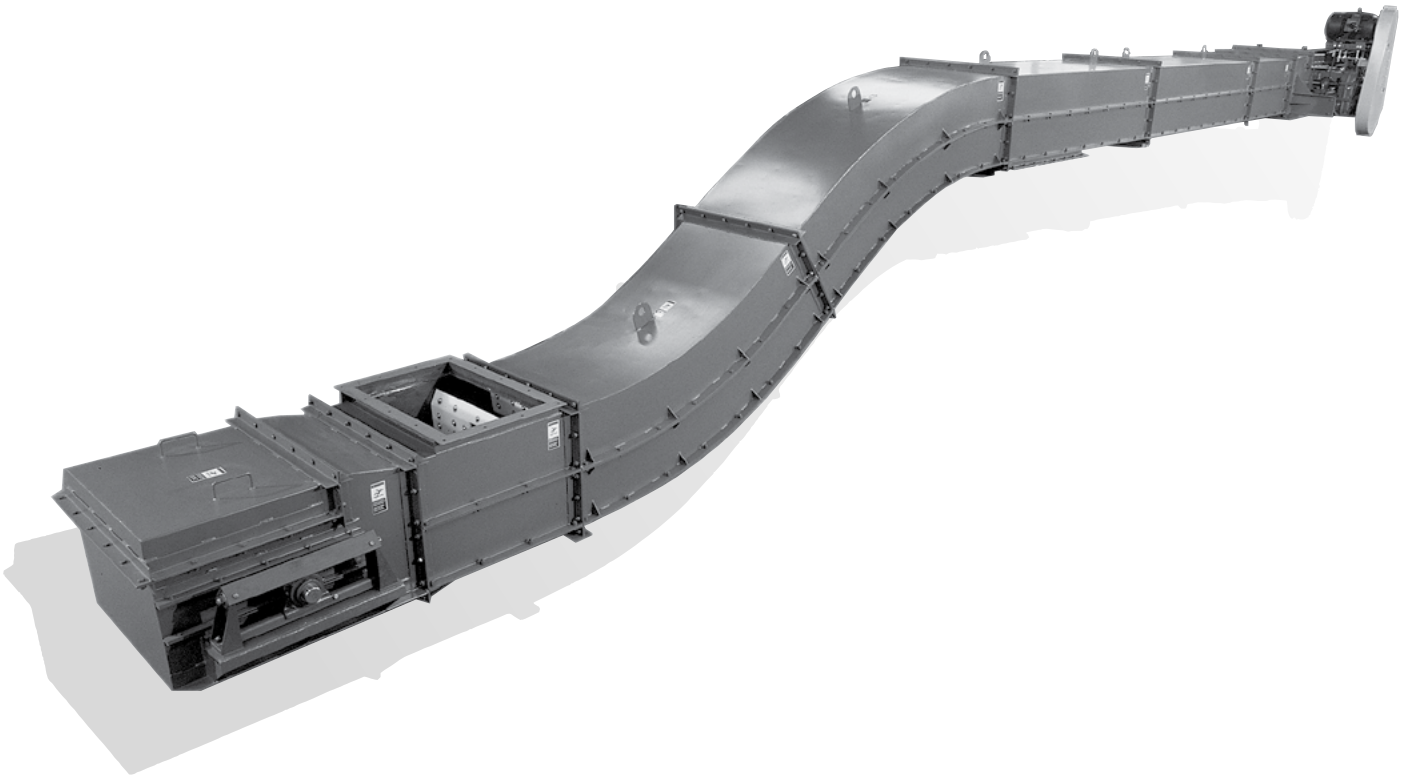
6. FIT UP & INSTALL LADDER





DETAIL A

Martin



DRAG CONVEYOR

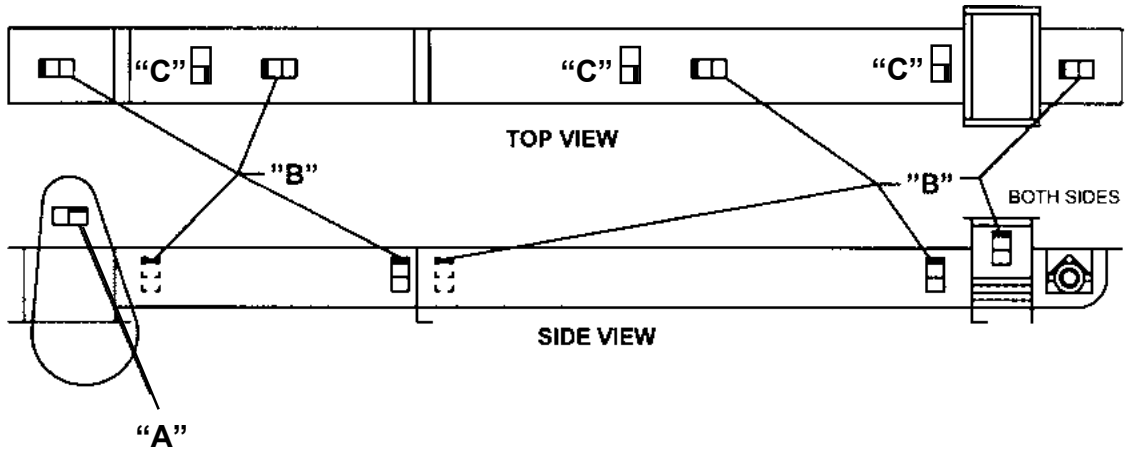
INSTALLATION, OPERATION AND MAINTENANCE MANUAL

INSTALLATION
OPERATION
MAINTENANCE
INSTRUCTIONS

CEMA Safety Labels Placement Guidelines

Product: Bulk Handling Equipment

Equipment: Drag Conveyors (**SC-1**)



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

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

RECEIVING

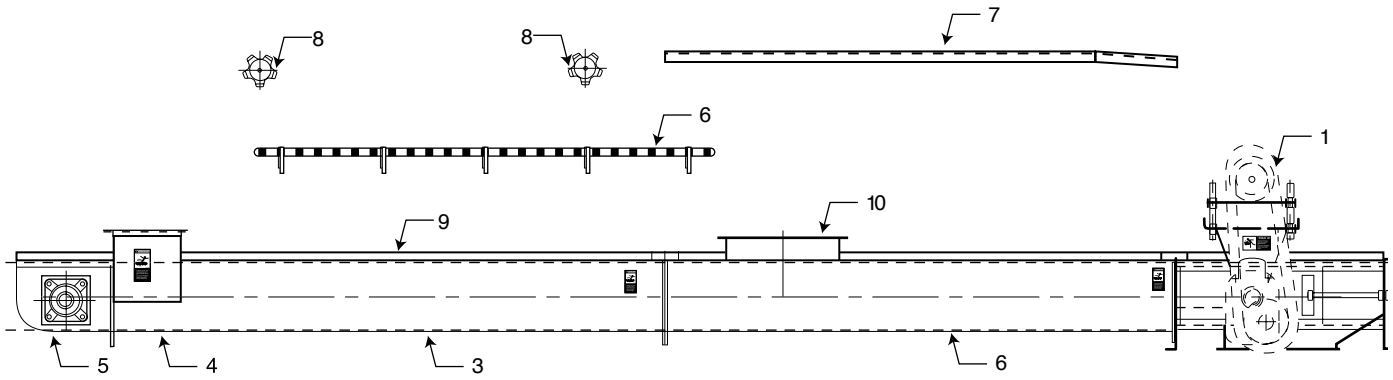
Immediately upon receipt all items in the conveyor or component shipment should be checked against shipping papers for shortages and inspected for damage. Items to be checked include bent or dented troughs, covers, flights, chain, guards, drives, etc. Note claims for damaged parts on shippers and immediately file a claim. DO NOT ATTEMPT TO INSTALL A DAMAGED ITEM OR CONVEYOR.

LIFTING AND MOVING

Extreme care must be taken to prevent damage when moving assembled conveyors or components. Spreader bars with slings are the recommended support method for lifting. The unsupported span should be no longer than 10 to 12 feet. Never lift a conveyor with only one support point. Unusually heavy items such as drives or gates shall be considered when choosing support points because of load balance and their bending effect.

ASSEMBLY

The above diagram is representative only. It is the responsibility of the purchaser to consult contract drawings for specific items on each conveyor.



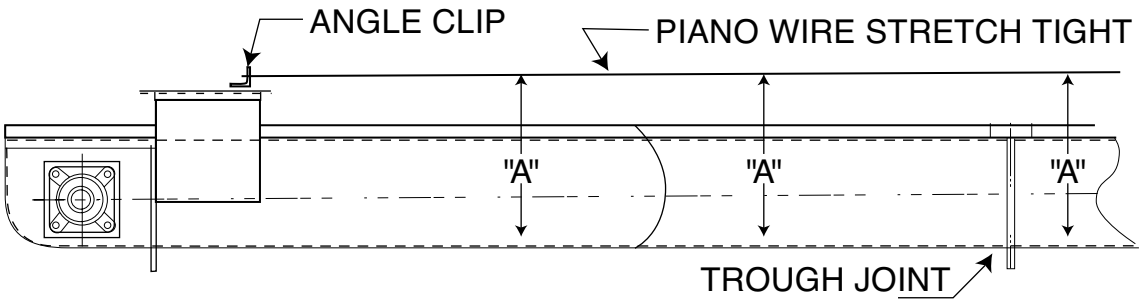
1. Shaft Mounted Drive, Motor Mount V-Belt Drive and Guard
2. Head Section with Take-up
3. Trough
4. Trough with By-Pass Inlet
5. Tail Section (self cleaning)
6. Chain with Flight Attachment
7. Rail Return
8. Idler Return
9. Hip Roof Cover
10. Standard Inlet

For safety and proper operation drag conveyors must be assembled and erected straight and true. It is the responsibility of the purchaser to insure all support and mounting surfaces are level and true so there is no distortion in the conveyor.

All component pieces (or conveyor sections) should be placed in proper sequence before assembly is started.

For shop assembled conveyors, units are match marked and shipped in longest sections practical for shipment. Field assembly can be accomplished by connecting marked joints and in accordance with packing list and or drawing if applicable. In field erection, the mounting surfaces for supporting the conveyor must be level and true so there is no distortion in the conveyor. Shims or Grout should be used when required. Check for straightness as assembly is made, the mounting surfaces for supporting the conveyor must be level.

For conveyor assemblies purchased as parts or merchandise, assemble as follows: Place conveyor troughs in proper sequence with tail, bypass inlet and head in proper location. Connect the trough flanges loosely. Do not tighten bolts. Align the trough bottom centerlines perfectly using piano wire (or equivalent) then tighten flange bolts. Tighten all anchor bolts.



"A" dimension should be equal for full length of trough, bottom to be smooth through joints.

Before connecting the top section of chain, loosen take-up as much as possible. Check sprocket alignment, set screws, and bearing mounting bolts for tightness.

1) Connect top section of the chain (on long conveyors, a come-a-long may be necessary)

2) Adjust take-up to remove excess slack from chain, being sure that adjustment screws have been tightened equally to prevent any misalignment.

3) Install trough covers in proper sequence. Handle covers with reasonable care to avoid warping or bending. Covers should be securely fastened.

4) Install drive at proper location and in accordance with separate instructions provided.

5) Rotate conveyor by hand to insure that no binding occurs.

6) Check for proper direction of chain and flight travel after electrical connections have been made, before attempting to handle material. If necessary after LOCK OUT/TAG OUT ALL POWER then reconnect electrical leads to reverse direction of material flow. Material should be pushed by the flight and attachment.

Lubricate all bearings and drives per service instructions. Gear reducers are normally shipped without lubricant. Refer to service instructions for lubrication.

Check conveyor to insure all tools and foreign materials have been removed.

Check conveyor to insure all covers, guards, and controls to other equipment is installed and operating properly.

In start-up of the conveyor, operate several hours empty as a break in period. Observe for bearing heat up, unusual noises or drive misalignment. Should any of these occur, check the following and take necessary corrective steps.

1) When anti-friction bearings are used, check for proper lubrication. Insufficient or excess lubricant will cause high operating temperatures.

2) Misalignment of troughs, loose chain and misalignment of sprockets can require excessive maintenance and cause poor life expectancy.

3) Check assembly and mounting bolts; tighten if necessary.

After the conveyor has been run per the above instructions, stop the conveyor. **LOCK OUT/TAG OUT ALL POWER**, and check discharge to insure it is clear and material flow through the discharge will not be impeded in any way.

Restart the conveyor and gradually begin to feed material. The feed rate should be gradually increases until the design capacity is reached.

Do not overload conveyor. Do not exceed conveyor speed, capacity, material density, or rate of flow for which the conveyor and drive were designed.

Cut off feed and allow the conveyor to empty. **LOCK OUT/TAG OUT ALL POWER SUPPLY**.

Check all bolts and all alignments. Realign as necessary, tighten all bolts and check chain adjustment.

If the conveyor is to be inoperative for a prolonged period of time, operate conveyor until cleared of all material. This is particularly important when the material conveyed tends to harden or become more viscous, or sticky if allowed to stand for a period of time.

It may be necessary to readjust chain tension after running material in conveyor.

Check motor amperage frequently.

It is extremely important the following precautions be followed to prevent personal or property damage:

1) Only persons properly trained and familiar with drag conveyors be permitted to operate or maintain the unit.

2) **LOCK OUT/TAG OUT ALL POWER** prior to any inspection or maintenance, refer to ANSI Standard ANSI Z244.1.

3) Periodically run the conveyor empty for a few minutes to check for excessive vibration, loose fasteners, security of covers and guards, noise, and bearing and drive temperature.

4) ALWAYS operate the conveyor with covers, guards, safety labels in place.

5) NEVER walk on or across conveyor covers, guards or grating.

6) DO NOT place hands, feet or clothing in conveyor openings.

7) DO NOT poke or prod the conveyor or material in the conveyor.

PROBLEM	CAUSE	REMEDY
PREMATURE TROUGH FAILURE	A) Gauge too light	A) Increase thickness. Consult catalog materials table /component series for recommendation.
	B) Worn flights	B) Replace flights
	C) Excessive chain speed	C) Check speed
ACCELERATED FLIGHT WEAR	A) Excessive heat	A) Change flight material. UHMW limited to 175ºF
	B) Speed too high	B) Slow drag down. Consult catalog engineering section to determine proper speed.
CHAIN BREAKAGE	A) Worn chain	A) Change chain if worn
	B) Take-up loose	B) Adjust take-up
DRIVE SHAFT BREAKAGE	A) Excessive torque	A) Recalculate HP requirements
	B) Insufficient torque capacity	B) Increase torque capacity
	C) Obstruction in conveyor	C) Check sprocket alignment
MOTOR/HEATERS OVERLOAD	A) Amp demand excessive for motor	A) 1. Recheck horsepower 2. Check material characteristics 3. Check capacity. Assure regulated feed.
INLET TROUGH END BEARING FAILURE	A) Material getting into bearing	A) Add or upgrade seal to keep material out of bearing. Change to outboard bearing.
	B) Insufficient lubrication	B) Lubricate properly
DISCHARGE TROUGH END BEARING FAILURE	A) Material getting into bearing	A) 1. Add or upgrade seal. 2. Change to outboard bearing.

MAINTENANCE

Before any maintenance or inspection is performed, refer to ANSI Standard ANSI Z244.1 for minimum safety requirements covering **LOCK OUT/TAG OUT ALL POWER** or energy sources for personal safety.

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

Establish routine periodic inspections of the entire conveyor to insure continuous maximum operating Performance.

To replace or shorten conveyor chain section, proceed as follows:

1) Locate the cotter pin section of chain and rotate the chain until it is on the top (**LOCK OUT/TAG OUT ALL POWER**).
2) Loosen take-up fully and remove cotter pin and remove desired length.
3) To reassemble, follow the above steps in reverse order.

Replacement parts can be identified from a copy of the original packing list, invoice or drawing. Periodic inspections should be made of the following:

1) Trough. Check for wear and alignment. Tighten all bolts.
2) Shafts. Check for wear.
3) Flights. Check edges for wear or damage.
4) Bolts and nuts. Check all for wear and tightness.
5) Seals. Check for leakage, adjustment and wear.
6) Guards. Check for oil level (if applicable).
7) Bearings. Check for lubrication.
8) Sprockets. Check for wear and alignment.
9) Chain. Check for worn pins and damaged side bar.
10) Take-up. If take-up fully adjusted, a link of chain will need to be removed.

EXTENDED SHUTDOWN / STORAGE

If the conveyors are to have an extended shutdown or storage (beyond one month) the following should be performed:

1) Insure all foreign material is removed from the conveyor and surface coatings are in good order.
2) All bearings and drives are lubricated and protected per manufacturer's instructions.
3) The conveyor is protected from weather, moisture and extreme temperatures. Do not use plastic or other coverings which promote condensation under the covering.
4) All exposed metal surfaces are coated with a rust preventative oil that is applied per instructions.
5) Prior to start-up, installation and operation instructions contained in this manual must be performed.

SUGGESTED INSPECTION SCHEDULE

Before any maintenance or inspection is performed, refer to Martin Drag Conveyor, Installation, Operation and Maintenance Manual and to any pertinent ANSI standards.

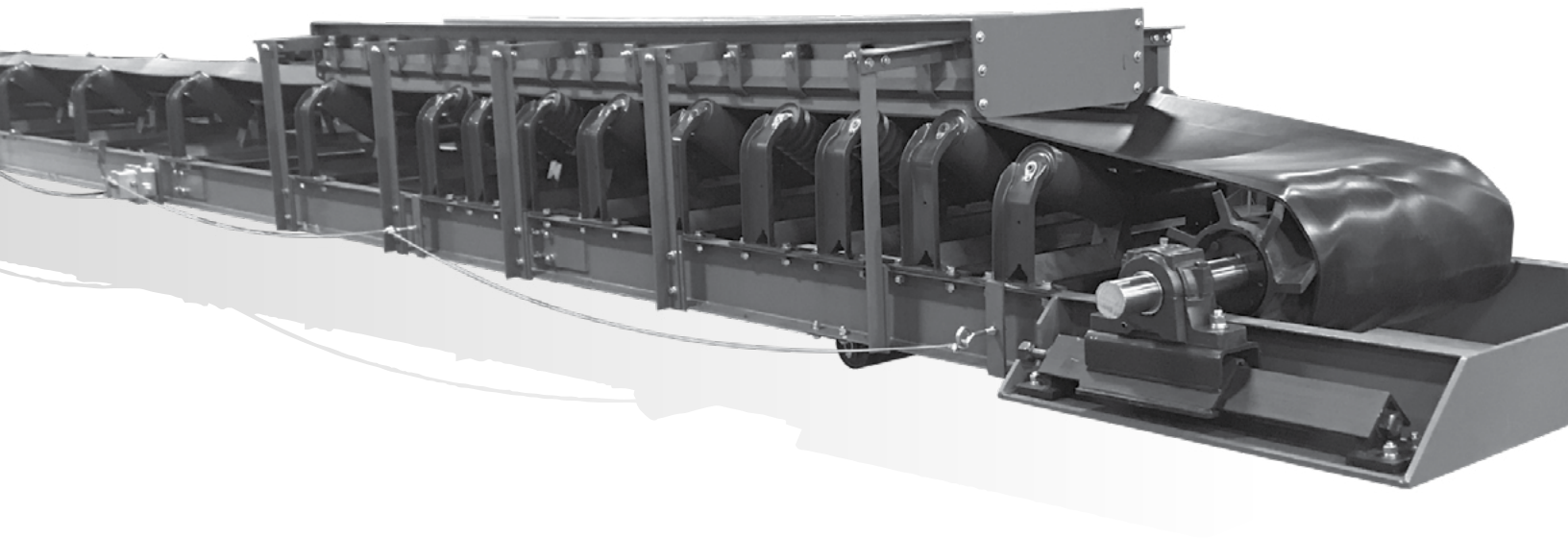
Practice good housekeeping. Keep the area around the conveyor and drive clean and free of obstacles to provide easy access and to avoid interference with the function of the conveyor and drive.

Periodic inspections should be made of the following:

1)	Trough	Check for wear and alignment. Tighten all bolts. **MONTHLY**
2)	Shafts	Check for wear and misalignment. **MONTHLY**
3)	Flights	Check edges for wear or damage and tightness of bolts & nuts. **MONTHLY**
4)	Bolts and Nuts	Check all for wear and tightness. **MONTHLY**
5)	Seals	Check for leakage, adjustment, and wear. **MONTHLY**
6)	Guards	Check for oil level (if applicable). **MONTHLY** Check nuts and bolts for tightness. **MONTHLY** Check that all guards are securely fastened. **WHENEVER OPERATING !!!**
7)	Bearings	Check for lubrication. Refer to specific instructions as various types of bearings require varying frequency of lubrication and varying types of lubrication. All bearings should be checked for wear. **MONTHLY**
8)	Chain	Check for wear and alignment. **MONTHLY**
9)	Covers	Check that all covers are securely fastened or the conveyor is guarded. **WHENEVER OPERATING !!!**
10)	Safety Labels	Check that all labels are properly installed and clearly visible. **MONTHLY**
11)	Drives	All drives to be checked and maintained per manufacturers recommendation

The above recommended inspection schedule is only advisory and your inspection schedule may need to be adjusted to meet actual operating conditions.

Martin



BELT CONVEYOR

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

INSTALLATION
OPERATION
MAINTENANCE
INSTRUCTIONS

CEMA Safety Labels Placement Guidelines

Product: Bulk Handling Equipment

Equipment: Bulk Belt Conveyors (**BH-1**)

“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”

(LOCATE ON INSPECTION DOOR(S))
To be located on conveyors where there are exposed moving parts which must be unguarded to facilitate function, i.e. rollers, pulleys, shafts, chains, etc

“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.

“D”

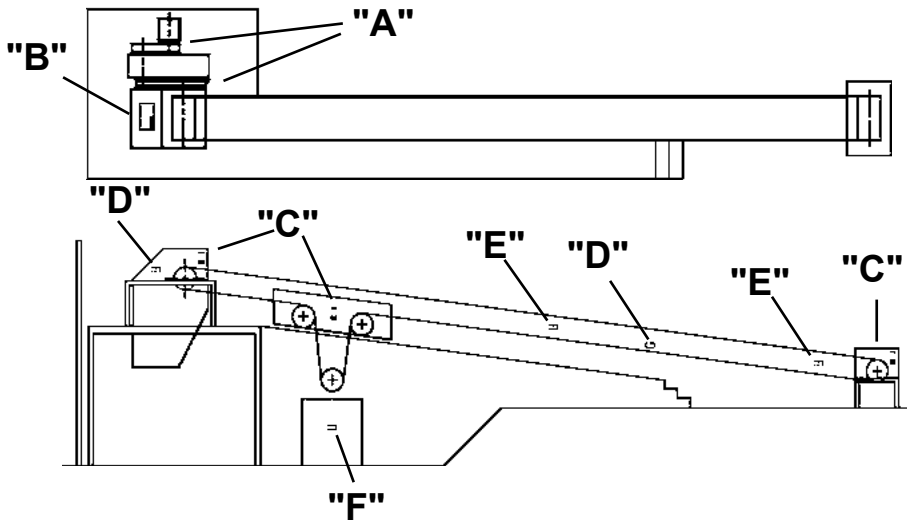
(LOCATE AT ENTRACE TO CONVEYOR WALKWAY)
General warning to personnel that a conveyor’s moving parts, which operate unguarded by necessity of function, i.e. belts, rollers, terminal pulleys, etc. Create hazards to be avoided; in particular, conveyors which stop and start by automatic control near operator work stations would use this label

“E”

(SPACE UP TO A MAXIMUM OF 50 FT CENTERS (WALKWAY SIDES))
To be placed up to a maximum of 20 ft centers along the walkway side

“F”

To be placed at entrances to enclosed areas which would expose personnel to operational or environmental hazards which should only be entered by trained and authorized personnel under specific conditions.
Examples: lifting conveyors, transfer car aisleways, confined spaces, etc



Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

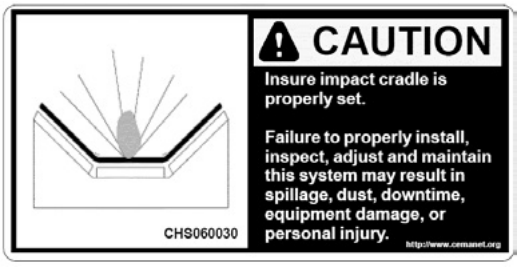
CEMA Safety Labels Placement Guidelines

Product: Bulk Handling Equipment

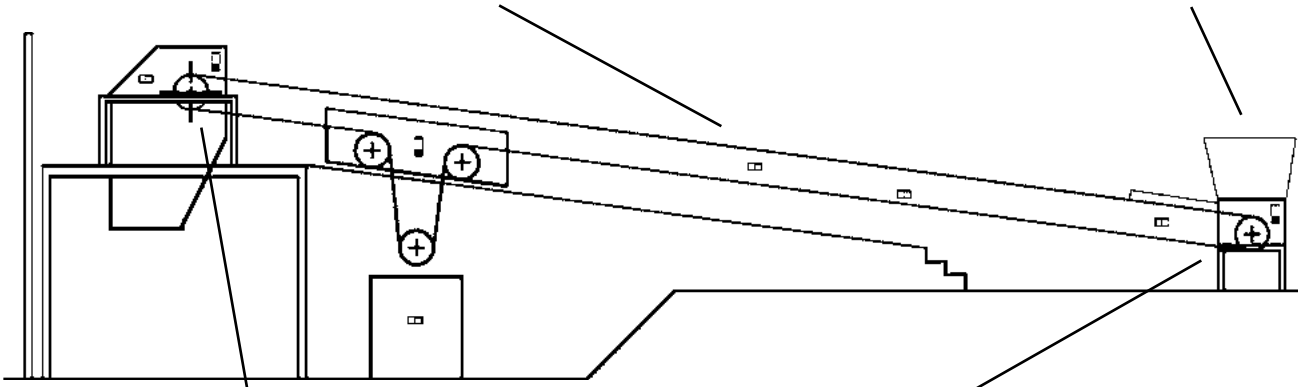
Equipment: Bulk Belt Conveyor Accessories (**BH-2**)

These labels are to be placed on or near the maintenance access for the following bulk belt conveyor accessories

Belt Skirting Systems

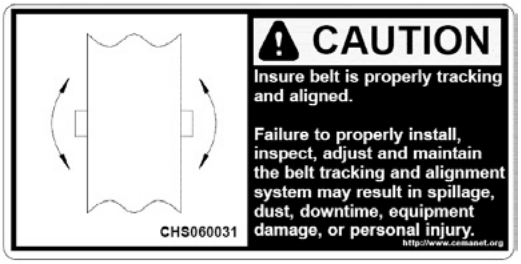


Impact Beds and Cradles



Belt Cleaners and Scrapers

Belt Tracking and Alignment Systems



THIS GUIDELINE SUPPLEMENTS CEMA BULK HANDLING EQUIPMENT PLACEMENT GUIDELINE - **BH-1**

Provided by Martin Sprocket & Gear, Inc. under license from the Conveyor Equipment Manufacturers Association (CEMA).

1) It is the purchaser's responsibility to provide a suitable foundation and bolts to receive the Belt Conveyor.

2) **Receiving**: It is important to carefully examine incoming shipments for condition and completeness. Shortages and damage must be reported immediately to the transportation company. DO NOT ATTEMPT TO INSTALL A DAMAGED BELT CONVEYOR OR COMPONENTS.

3) Normally head and tail sections are factory assembled and include pulleys, take-up frames, bearings, belt cleaners, discharge chute, tail pulley guard, idlers, skirt board and cover brackets with support bands if applicable.

4) Intermediate sections are shipped separately in 20 feet, 40 feet or any other special length as required and shown on drawings supplied with idlers, skirt board and cover brackets with support bands mounted on conveyor frame.

5) Sheet metal for covers, cable, eye-bolts, emergency stop switches, speed switch, belt misalignment switches and chute plug detector switch are field mounted by others if applicable.

6) Drives and motors are usually shipped mounted with head section, but removed in some instances for field installation by others if required.

7) Belt is usually shipped in separate containers or on pallets/skids for field vulcanizing by others or mechanical fasteners field installed by others. The extra belt length for vulcanized splice is furnished, but material and labor required to vulcanize the belt is by others. Mechanical fasteners and template required is usually furnished, but tools required to install will be furnished by installer.

8) If supports are in our scope of supply, they will be shipped loose and will be field installed by others. Anchor bolts and foundations for supports furnished by others

1) General Arrangement and BOM drawings are supplied prior to receiving the equipment at job site. These drawings show location of supports and support loads at each location. If supports are supplied with conveyor, there will be anchor bolt size and setting plan shown for each support. Providing proper foundation and anchor bolts is the responsibility of others. If supports are supplied by others, they must be located within +/- 1'-0" from the location shown on drawings. Supports should be designed to withstand minimum dead load and live load shown on drawing plus any wind, seismic or snow loads as applicable.

2) It is recommended that the equipment be stored indoors. If it is not possible, it can be stored outdoors under the roof, as long as the conveyor and components are protected from weather, moisture and extreme temperatures. Do not use plastic or other coverings which promote condensation under the coverings. Belt is usually packaged on a skid with roll in upright position and normally thicker cover (carrying side) out, or in cylindrical crate which can be rolled from place to place with direction of rotation arrow of the roll is marked. The belt should be stored indoor in a cool dry room free from sunlight, moisture and any other hazard. The belt should not be stored on edges. Upright roll on a dry wooden skid or in a cylindrical crate is recommended.

3) It is recommended that each assembled belt conveyor section must be picked up with minimum 2 point pick up or may be more depending on the length of each section with maximum distance between pick up points not to exceed 15 feet and maximum overhang not to exceed 5 feet on each end.

4) Generally Belt Conveyor installation begins at the tail section and proceed towards the head section. However, different approach may be taken if it suits to company or installer. While installing the tail section, angle of incline specified on drawing must be checked within at least two decimal, preferably to 3 decimal, because if angle of incline is not correct for tail section and conveyor is long, there can be several inches of difference by the time installation comes to head section.

5) The installation of conveyor frame must be level, straight, parallel and must have good alignment at all pulley locations and idlers must be square. Although pulley shaft alignment and squareness of idlers are checked in the shop for each section, it may deviate due to vibrations during transportation and during shipping and handling. Therefore, it is recommended to check again in field after installation and adjusted if necessary. Accurate alignment of conveyor frame is necessary to insure a true running belt. The recommended alignment of conveyor frame is within maximum of+/- 1/8" for conveyor centerline head to centerline tail pulley length of 100'-0" or less, within maximum of+/- 3/16" between 100'-0" to 200'-0" length, within maximum of+/- 3/8" between 200'-0" to 500'-0" length and with a maximum of+/-½" for conveyor length over 500'-0". Use shims if required for alignment.

6) Once the alignment is achieved, the conveyor frame should be secured to the support and all bolted connections are tightened to the proper torque. The overhang of the conveyor frame must not exceed 5'-0" from the support, otherwise temporary support is required until next section is installed.

7) If it is screw take-up, it should be set at approximately 3" from the full forward position before installation of belt. If it is a gravity take-up, top of frame should be positioned approximately 1'-0" below the bottom of upper stop on the take-up guides.

8) It is very important that installer make certain that thicker rubber cover of the belt will be on top or load carrying side before stringing the belt. For hoisting, a bar is passed through the hole in the center of the roll. Chains or cables looped around the bar ends should have spreader above the roll to avoid damage to belt edges. See Figure 1. Mount the roll on a suitable shaft and structure for unrolling and threading onto the conveyor. Normally belt is rolled at the factory with thicker cover (carrying side) out. Consequently, the belt must lead off the top of the roll if it is being fed onto the carrying idlers. If belt is being fed onto the return idlers, it must be lead off the bottom of the roll. A temporary flat idler roll should be installed at the bend point of the belt while fed into carrying idlers. See Figure 2.

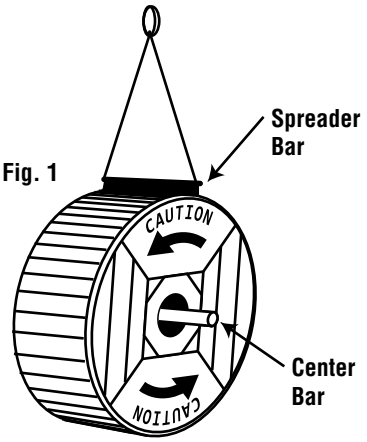


Fig. 1

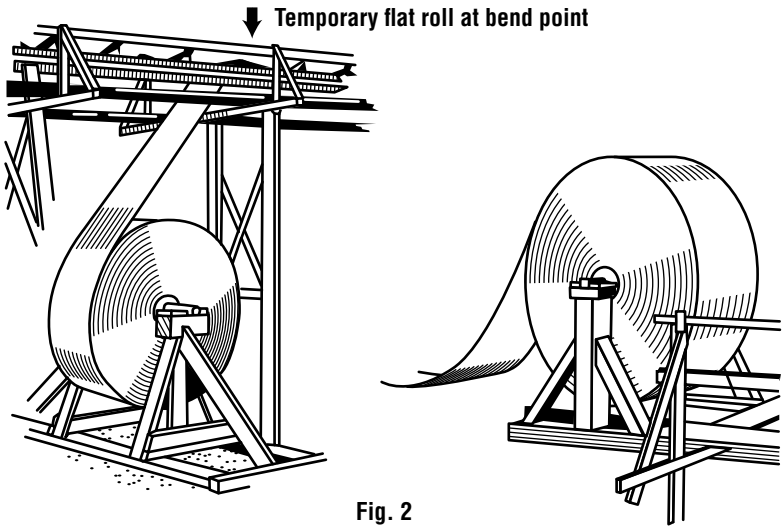


Fig. 2

Note: Temporary flat roll at bend point, as roll is pulled onto troughing idlers.

9) In some case, such as in mines, where head room does not permit maneuvering a roll, the belt may have to be pulled off the roll and reefed (Figure 3). Extreme care should be exercised to see that the loops have large bends to avoid kinking or placing undue strain on the belt. Weight should never be placed when it is in this position.

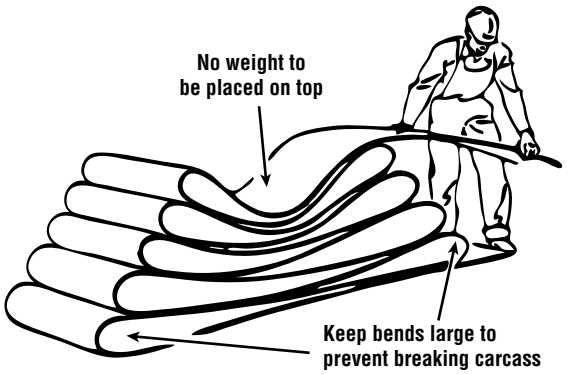


Fig. 3
Reefing the Belt

10) It is recommended, especially in cool environments, to leave the belt in place for 24 hours before stringing or stretching. This will relieve stresses from being rolled up. Installer may use clamping method using angle iron or apply their standard techniques for stringing and tensioning the belt to remove slack and to avoid initial dissipation of take-up travel. The tensioning takes place at the location where splice will be made. Use caution to avoid over tensioning the belt as this can cause premature failure. Remove all clamping before making a splice.

11) The splice should be made at the bottom of slope for inclined conveyors where splicing tension required is lowest. On a conveyor with gravity take-up, the splice should be made near the take-up and weight box should be raised to the uppermost position with come-along or other means when splicing the belt. For mechanical fasteners splice, fasteners and template are furnished, but tools required will be furnished by installer. For vulcanized splice, extra belt length required is furnished. Vulcanizing of belt and materials required for vulcanizing will be supplied in field by others.

12) After belt is installed; adjust the screw take-up to apply proper tension, and adjust the belt cleaners using tensioner to keep the required blade pressure against the belt. Use caution not to over-tension the belt or cleaner blade as premature failure of belt may occur or cleaner blade may wear out. Adjust rubber skirts in loading area such that rubber should lay on belt with a minimum pressure. Check bearings bolts, setscrews if applicable for bearings and pulley setscrews for tightness. Install cable, emergency stop switches and any other instrumentation as per the drawings supplied. Make sure all idlers are square, pulleys aligned properly all bolts are tight and properly torqued. Install drives and backstop at this time if not factory assembled. Check if gear reducer is filled with oil to proper level and motor rotation is correct.

13) Check to insure belt conveyor is free of foreign materials before connecting to power.

14) Check to insure all guards, covers, safety devices and controls are in place and operating correctly.

1) The conveyor should be jogged on and off until belt has made several revolutions during the initial start-up.

2) Training the belt empty is a process of adjusting idlers and loading conditions in a manner which will correct any tendency of the belt to run off. The idler axis of few idlers may be adjusted if belt run-off one side. Note the run-off location and adjust few preceding idlers. The return side should be adjusted first starting at the head end. The adjustments are made by shifting the idler axis slightly so that the belt contacts the roll of the idler opposite the run-off. See Figure 5. The carrying side can then be adjusted by using the same procedure starting at the tail end and proceeding towards the head end.

3) Once the belt is trained empty, start with a light load and gradually increase to the capacity conveyor was designed to handle. A properly trained empty belt will run true if loading is uniform and to the center of the belt. Check chutes to see if material is being directed onto the center of the belt. An off-center load will affect the belt alignment in that the belt will run off center, will wear the belt edges and spill material on sides. See Figure 4. The desired condition is to load the material centrally on the belt at the same speed and in the direction of belt travel with a minimum impact on the center of belt.

Fig. 4
Effects of Off-Center Loading

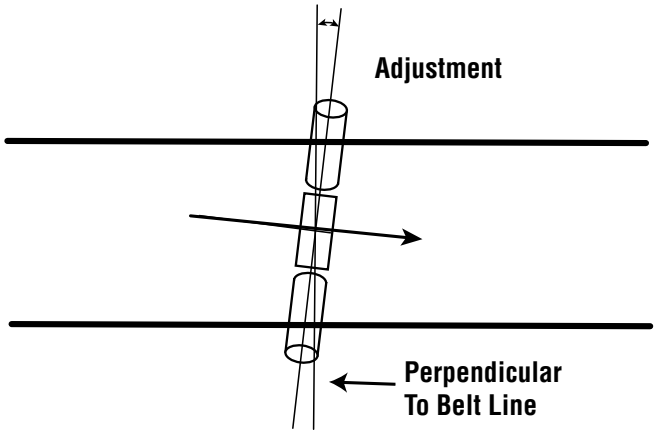


Fig. 5

1) Regular scheduled and periodic inspection and maintenance by trained personnel is the best for preventive maintenance. It reduces downtime, save money over the course of equipment life and ensures safe and efficient operation of the system.

2) Good housekeeping is essential for safe and efficient operation of belt conveyors.

3) Check the loading areas of the conveyor regularly for uniform and center loading. Surge loading or non-uniform loading or off centered loading can wear out the components and result in spillage.

4) Check for any noticeable vibrations or noise, as this can cause loosening of bolts of idlers and result in misalignment of idlers.

Warning: Removal of backstop or torque arm for shaft mount reducer may cause unexpected machinery movement.

Caution: Lock Out / Tag Out power procedures must be strictly followed at all time. Practice good housekeeping. Keep the areas around loading, discharge, drives and control point clean and free from obstructions to maintain safe environment for all personnel.

MAINTENANCE CHECKLIST

Pulleys:

- ☐ Check Pulley alignment, lagging surface if it is lagged pulley and material build up on pulley. Pulley assemblies should rotate freely.

  Use shims and other standard techniques to properly align pulleys. Remove any material built up on pulleys. Replace lagging or pulley if lagging is worn out.

Bearings:

- ☐ Check for proper alignment to frame, any unusual noise and material build up on bearing.

  Use shims as required for proper alignment. Unusual noise is an early indication if bearing failure. Replace bearing if unusually noisy. Remove any material built up on bearings.

Manual Screw Take-up Frames:

- ☐ Check for proper belt tension and material build up on screw take-up frames.

  Periodic readjustment of manual screw take-up is required as the belt stretches to maintain proper tension. Under normal circumstances, bet travel should be sufficient for the service. In case, screw take-up is moved to its maximum position, move the take-up back to its original position, cut-out the old splice and excess belt, manually re-tension and re-splice the belt. Use caution not to over-tension the belt as this may result in premature belt failure. Remove any material built up on manual screw take-up frames.

Gravity or Counterweighted Take-up:

- ☐ Check for proper belt tension.

  Add or remove any weights as required.

Belt Cleaners:

- ☐ Check for proper blade tension against belt, blade wear and material build up.

  Adjust the belt tension as required. Do not apply too much tension, as this may cause premature wear of blade and belt. Do not apply too low tension, as this will not clean the belt properly. Proper blade tension against the belt is required to clean belt efficiently and not wear blade and belt prematurely. If blade wore out, replace blade or belt cleaner. Remove any material build up.

Head Discharge Chute and Tail Feed chute:

- ☐ Check for any significant wear on wear liners.
- ☐ Check for any clogged or bridged material in chutes.
- ☐ Check for material feed at the center of belt and not on one side.

  Replace wear liners if they are worn. Remove any clogging or bridged material. If material is not feeding in the center of the belt, redesign the feed chute, so that material feeds at the center of the belt and in the direction of belt travel.

Idlers:

- ☐ Walk thru length of conveyor and check if all idler rolls are turning freely and smoothly. Unusual noise is an early indication of roll failure. Stalled rolls should be replaced, as this causes belt wear.
- ☐ If sealed for life idlers are supplied, they are not required to be greased. If regreasable type idlers are supplied, they must be greased properly at regular intervals as per manufacturer's recommendation.
- ☐ Check for squareness of idlers after replacing any idler and also at regular interval in case vibration causes the idlers misalignment.

- ☐ Some manufacturer supply idlers that have 2 degrees tilt in the direction of belt travel due to their self-aligning capability. Care should be taken to install these idlers correctly so that tilt is forward in the direction of belt travel, otherwise there will be detrimental effect on aligning capability.
- ☐ Check for any material build up on idler rolls, frames or brackets.

  Replace noisy, frozen, wore out or damaged idlers. Lubricate idlers if they are regreasable type at regular intervals in accordance with manufacturer's recommendation. Adjust idler axis at regular intervals or after each new idler installation. Make sure idlers are installed correctly, if 2-degree forward tilt idlers in the direction of belt travel are supplied. Remove any material built up from idler rolls, frames or brackets.

Skirtboard:

- ☐ Check for any significant wear on wear liners.
- ☐ Check for any wear on rubber skirts.
- ☐ Check for any lodged material between skirtplate and rubber.

  Replace wear liners if they are worn. Replace rubber skirts if they are worn. Remove any material stuck between skirtplate and belt.

Belting:

- ☐ Check belt for cuts, breaks, damaged and worn spots and report immediately for repair or replace.
- ☐ Check if mistracking belt does not touch any stationary surface or structural steel, as this wears out the belt and edges.

  Repair the spots that are damaged or worn. Replace the belt if it wore out at too many locations. Correct tracking issues by aligning pulleys and idlers and if unsuccessful, add tracking devices.

Motor:

- ☐ Check for oil level and any unusual noise.

  Lubricate internal bearings and fill oil level as per manufacturer's recommendation.

Gear Reducer:

- ☐ Check for oil level and any unusual noise.

  Lubricate internal bearings and fill oil level as per manufacturer's recommendation.

V-Belts:

- ☐ Check for proper tension and worn or cracked areas.

  Replace worn or cracked belts as required.

Roller Chain and Sprocket drives:

- ☐ Check for proper tension and worn chain or sprockets.

  Replace worn roller chain and sprockets.

TROUBLESHOOTING TABLE 1

PROBLEM OR SYMPTOM	REASON CODE In probable order of occurrence					
Belt runs off at tail pulley	7	15	14	17	21	34
Entire belt runs off at all points of the line	26	17	15	21	4	16
One belt section runs off at all points on the line	2	11	1	34		
Belt runs off at head pulley	15	22	21	16	34	
Belt runs to one side entire length at specific idlers	15	16	21	34		
Belt slip	19	7	21	14	22	
Belt slip on starting	19	7	22	10		
Excessive belt stretch	13	10	21	6	9	
Belt breaks at or behind fasteners or fasteners tear loose	2	23	13	22	20	10
Vulcanized splice separation	13	23	10	20	2	9
Excessive belt wear including rips, gouges, ruptures and tears	12	25	17	21	8	5
Excessive belt bottom cover wear	21	14	5	19	20	22
Excessive belt edge wear, broken edges	26	4	17	8	1	21
Belt cover swells in spots or streaks	8					
Belt hardens or cracks	8	23	22	18		
Belt covers becomes checked or brittle	8	18				
Longitudinal grooving or cracking of belt top cover	27	14	21	12		
Longitudinal grooving or cracking of belt bottom cover	14	21	22			
Belt fabric decay, carcass cracks, ruptures, gouges (soft spots in belt)	12	20	5	10	8	24
Belt ply separation	13	23	11	8	3	
Build up on Bend Pulleys and return idlers	32	33	8	22		
Spillage of fines and small particles in loading area	27	28	17	12	30	
Spillage of larger particles and lumps along conveyor	15	29	30	31	35	
Plugged chutes	35	33	34	31		
Damaged to accessories in contact with the belt	31	2	11			
See Table 2 below for possible solutions						

TROUBLESHOOTING TABLE 2

	CAUSE	SOLUTION
1	Belt bowed	Avoid telescoping belt rolls or storing them in damp locations. A new belt should straighten out when “broken in” or it must be replaced.
2	Belt improperly spliced or wrong fasteners	Use correct fasteners. Retighten after running for a short while. If improperly spliced, remove belt splice and make new splice. Set up regular inspection schedule.
3	Belt speed too fast	Reduce belt speed.
4	Belt strained on one side	Allow time for new belt to “break in”. If belt does not break in properly or is not new, remove strained section and splice in a new piece.
5	Breaker strip missing or inadequate	When service is lost, install belt with proper breaker strip.
6	Counterweight too heavy	Recalculate weight required and adjust counterweight accordingly. If screw take-up, reduce take-up tension to point of slip; then tighten slowly.
7	Counterweight too light	Recalculate weight required and adjust counterweight accordingly. If screw take-up, increase tension.
8	Damage by abrasives, acid, chemicals, heat, mildew, oil	"Use belt designed for specific condition. For abrasive materials working into cuts and between plies, make spot repairs with cold patch or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow and sun. Don’t over-lubricate items."
9	Differential speed wrong on dual pulleys	Make necessary adjustment.
10	Drive under-belted	Recalculate maximum belt tensions and select correct belt. If conveyor is over-extended, consider using two-flight system with transfer point. If carcass is not rigid enough for load, install belt with proper flexibility when service is lost.
11	Edge worn or broken	Repair belt edge. Remove badly worn or out-of square section and splice in a new piece.
12	Excessive impact of material on belt or fasteners	Use correctly designed chutes and baffles. Make vulcanized splices. Install impact idlers. Where possible, load fines first. Where material is trapped under skirts, adjust skirtboards to minimum clearance.
13	Excessive tension	Recalculate and adjust tension. Use vulcanized splice within recommended limits.
14	Frozen idlers	Correct or replace stalled rolls. Lubricate if idlers are regreasble. Improve maintenance. (Don’t over-lubricate)
15	Idlers or pulleys out-of square with centerline of conveyor	Realign. Install limit switches for greater safety.
16	Idlers improperly placed	Relocate idlers or insert additional idlers spaced to support belt.
17	Improper loading, spillage	Feed should be in direction of belt travel and at belt speed, centered on the belt. Control flow with feeders, chutes and skirtboards.
18	Improper storage or handling	Refer Installation section of this manual and consult us for storage and handling tips.
19	Insufficient traction between belt and pulley	Increase wrap with snub pulleys. Re-lag drive pulley if worn. Use grooved lagging in wet conditions. Install correct cleaning devices for safety.
20	Material between belt and pulley	Use skirtboards properly. Remove accumulation. Improve maintenance.
21	Material build-up	Remove accumulation. Install cleaning device and V-plow. Improve housekeeping.

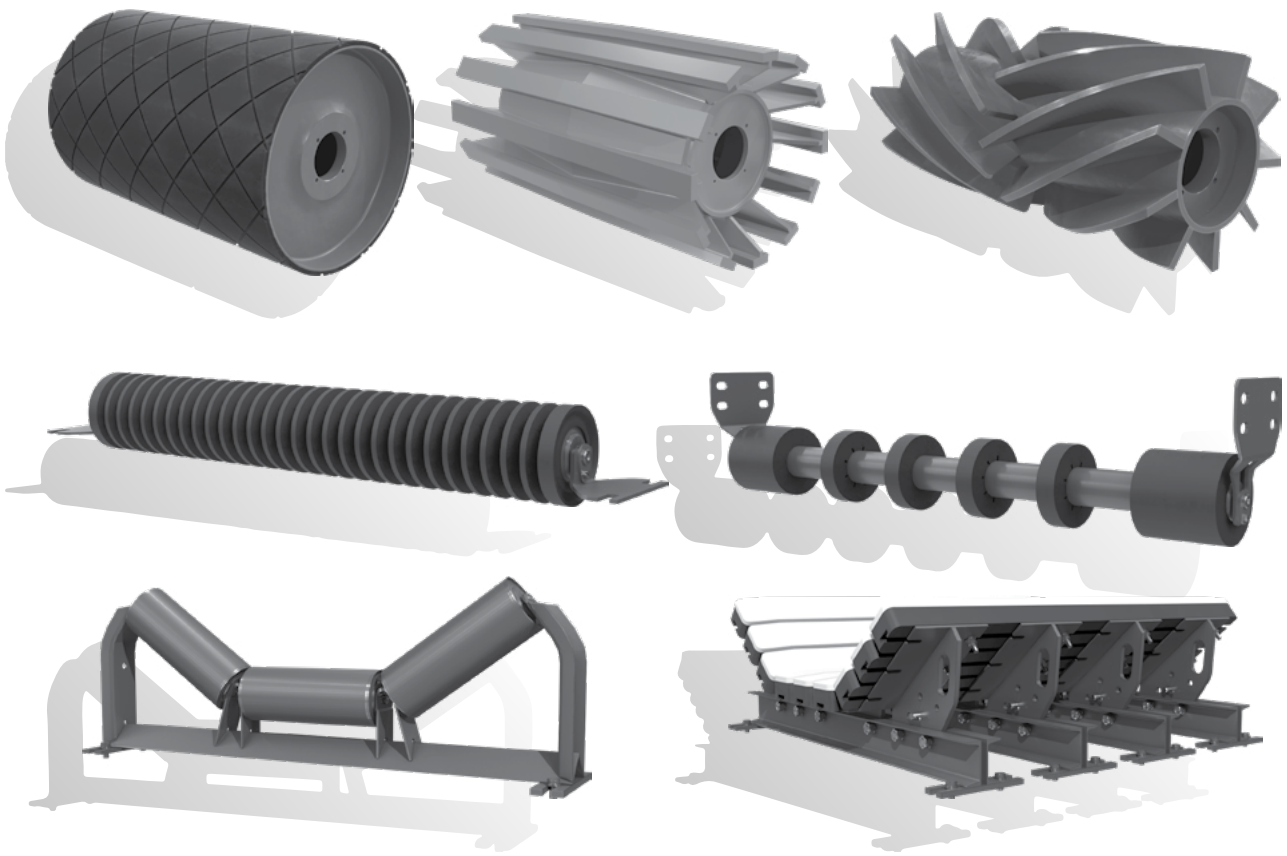
TROUBLESHOOTING TABLE 2

	CAUSE	SOLUTION
22	Pulley lagging worn	Replace lagging. Use grooved lagging for wet conditions. Tighten loose bolts.
23	Pulleys too small	Use large diameter pulleys.
24	Radius of convex vertical curve too small	Increase radius by vertical realignment of idlers to prevent excessive edge tension.
25	Relative loading velocity too high or too low	Adjust chutes or correct belt speed. Consider use of impact idlers.
26	Side Loading	Load in direction of belt travel, in center of conveyor.
27	Skirts improperly placed or not maintained	Install skirtboards so that they do not rub against the belt.
28	Wear liners missing, worn or improperly installed	Replace wear liners so the bottom edge is lined up and gradually relieving in direction of belt travel.
29	Belt overloaded	Operate belt feed system at design capacity or less.
30	Excessive belt sag	Recalculate take-up tension. Install belt support systems or reduce idler spacing.
31	Belt rolls back after shutdown	Install or repair backstop, belt holdback or brake.
32	Insufficient number of belt cleaners or lack of maintenance	Install additional belt cleaners or maintain existing cleaners more frequently.
33	Bulk material properties have changed	If a permanent change in bulk materials, redesign chutes, belt cleaners and re- evaluate conveyor speed, tension and belt type.
34	Emergency repairs or actions	Repair temporary fixes. Install accessory items to automatically activate. Avoid heating or hammering chutes and components.
35	Monitoring devices inoperable	Repair or activate monitoring devices.

1. Formal maintenance inspection and safety training for employees that are required to operate and maintain the equipment is the key to a safe workplace.
2. Lockout / Tag out all energy sources to belt conveyor, accessories and associated process equipment before beginning any work, whether it may be construction, installation, maintenance, inspection or lubrication. The person actually doing the work should be the only person with the key to the lockout device. In no case any equipment be serviced while in operation.
3. All safety devices should be in good working condition, properly maintained and easily accessible. Emergency stop switch with safety pull cables should be mounted at the proper height.
4. The equipment should be operated at or below design capacity and at a speed specified on drawings. Overloading belt conveyor results in spillage and hazardous working conditions and premature failure of components.
5. A designated place for all tools is recommended, so that all tools are removed and placed back at that location after installation and maintenance activity is completed.
6. Personnel safety equipment such as hard hats, safety glasses, steel toe shoes should be worn at all times while in work or operation area.
7. Hands, feet or any body parts should never come in contact with any conveyor components.

Stop all moving machinery during periods of lubrication, maintenance or inspection and strictly follow lockout/tagout procedure.

Martin



PULLEYS AND IDLERS

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

INSTALLATION
OPERATION
MAINTENANCE
INSTRUCTIONS

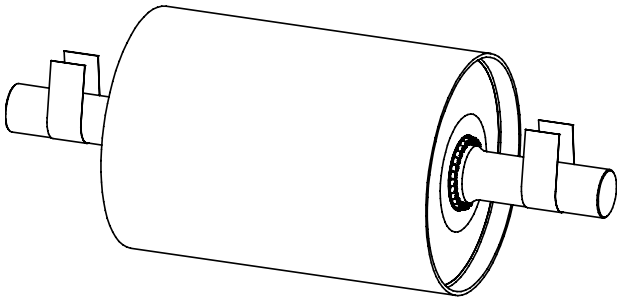
CONVEYOR PULLEY INSTALLATION

Installation Instructions:

1. Failure to follow the installation and operation instructions outlined below could result in serious injury. Follow all safety guidelines that pertain to your company's lockout/tagout/blockout procedures before performing maintenance or installation.
2. Remove debris from underside of the belt prior to installation. Failure to do so can result in belt damage and/or premature pulley wear.
3. Use appropriate lifting equipment when handling the pulley for assembly and installation. Never lift the pulley using the bearing housing.

   Lifting hardware on the bearing is not designed to support the pulley assembly weight.

4. Place weight rated nylon lifting straps around the pulley shaft between the pulley face and bearings. Place the straps as close to the pulley face as possible. Never use a chain to move a conveyor pulley assembly.



Alternate
lifting diagram
for pulley assemblies

5. Pulleys delivered on skids or cradles can be lifted with fork trucks, if trucks are rated for the weight capacity and forks extend through the skid or cradle.
6. Ensure pulleys are mounted square and perpendicular to the belt to help ensure best tracking. Tighten bearing base bolts securely and to bolt size and grade specifications (not included).
7. If taconite seals are used, ensure pulley misalignment from bearing to bearing is limited to 0.5 degrees to eliminate component binding and heat buildup or premature wear.

Assembly Procedure:

1. Identify all components for assembly and any specific assembly instructions or component requirements.
2. Clean all components and make sure shafts and bore of pulley hub and locking devices are free of dirt or contamination. Remove any protective coating that may be on shaft surfaces.
3. Place and secure pulley on secure platform or bench for assembly.
4. Install locking device onto the shafts and into the hubs of the pulley by following manufacturer's instructions. Do not apply lubricant to the hardware when installing as this can lead to premature failure.
5. Refer to locking device instruction manual for tightening and torque requirements. Use calibrated torque wrenches to tighten hardware loosely and ensure shaft is in the proper position.
6. Accurately torque the locking hardware per manufacturer's instructions. Confirm pulley is in correct position and properly aligned, as the axial position can move during tightening of locking hardware.
7. Check mounting surfaces and holes before mounting bearings and housing. Follow manufacturer's instructions for proper installation and alignment to ensure bearing and seal life. Secure bearings to the shaft and tighten the fixed/non-expansion bearing before tightening the floating/expansion bearing.
8. If coupling hubs are required, follow manufacturer's installation manual. Verify all coupling components are placed onto shaft before coupling hub. Install hubs based on clearance or interference fit instructions.
9. If any other components are required, follow manufacturer's instruction manual.
10. If not placed into service immediately, protect the entire pulley assembly from direct sunlight, rain, snow, or larger temperature and/or humidity variations.

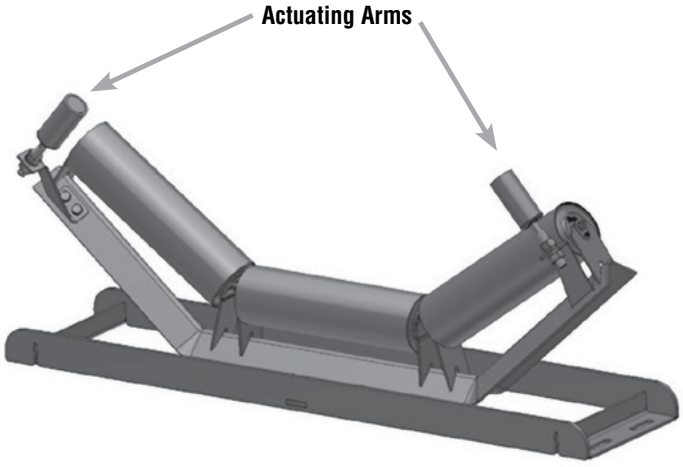
General Operation Instructions:

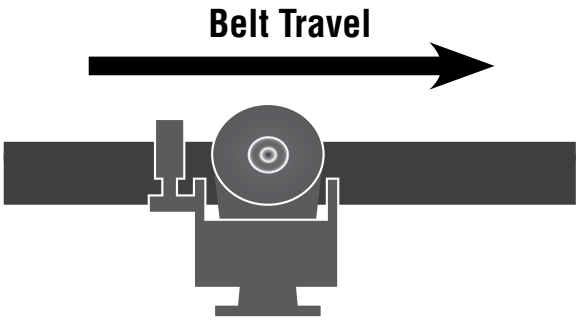
1. Inspect and torque locking device weekly in the first month of operation. If bolts are loosening, review pulley load and shaft deflection. Excessive shaft deflection may cause bolt retention issues. Do not over torque bolts.
2. Refer to the bearing manufacturers installation, operation and maintenance schedule for all bearing related instructions.
3. Inspect pulley periodically for lagging wear, cracks and rim adhesion. Deterioration may occur if oil, grease, kerosene, solvents or other chemicals remain on lagging.
4. Inspect pulley end discs and shell for cracks and signs of stress fatigue. Never operate a pulley with a cracked end disc and shell. Never drill, weld or make modifications to pulley end disc and shell as this may lead to pulley failure.
5. Inspect all take-up, snub and belt tensioning devices to ensure proper function and movement during operation. Improper belt tensions may result in component failure or belt and pulley wear due to excessive slipping.
6. Monitor bearings for proper alignment, movement and heat during operation. Use a dial indicator, check both elevation and squareness to the shaft is within manufacturer's recommended limits. If excessive movement occurs during operation, the bearing may not be properly secured to the shaft or bearing wear has occurred. A rise in temperature could indicate bearing failure. Re-lubricate per manufacture's recommendation.
7. Modification, repair or other work on a conveyor pulley assembly should not be performed without prior written consent of Martin Sprocket & Gear.

IDLER INSTALLATION

CAUTION: ALWAYS LIFT IDLERS BY THE FRAME, NEVER BY THE ROLLS.

1. Establish the conveyor centerline by use of a wire or string.
2. Remove mud, stones, burrs, or any other debris from the stringers so that the Pulleys and Idlers will sit squarely in position. This precaution will help prevent belt training problems.
3. Mount Pulleys level with the plane of the conveyor and perpendicular to the line of belt travel. Do not adjust the Pulleys after they have been accurately positioned.
4. Position Idlers perpendicular to the line of belt travel. **THE MIDDLE OF EACH CENTER ROLL MUST BE ON THE CENTERLINE OF THE CONVEYOR**. Tighten all four mounting bolts securely.
5. Rotate each roll to be sure it turns freely. If a roll is tight, look for some external interference or evidence of damage to roll or frame.
6. Install training Idlers with the same care and accuracy used in mounting the basic carrying and return Idlers.
7. To prevent damage during shipment, the actuating arms of positive action training Idlers are **NOT** mounted in operation position at the factory. Bolt the arms to the swivel frame so they extend **TOWARD THE APPROACH SIDE OF BELT**.



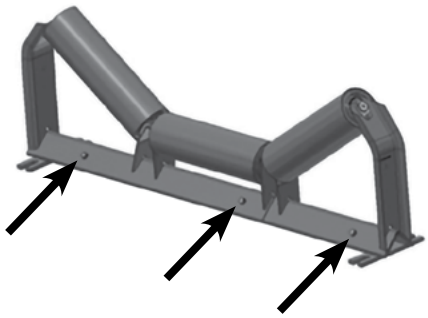


8. Inspect roll surfaces and remove any foreign material, especially abrasive dust, to prevent damage to the underside of the belt.
9. Install belt.

NOTE: All Martin Idlers are permanently lubricated at the factory before shipment.

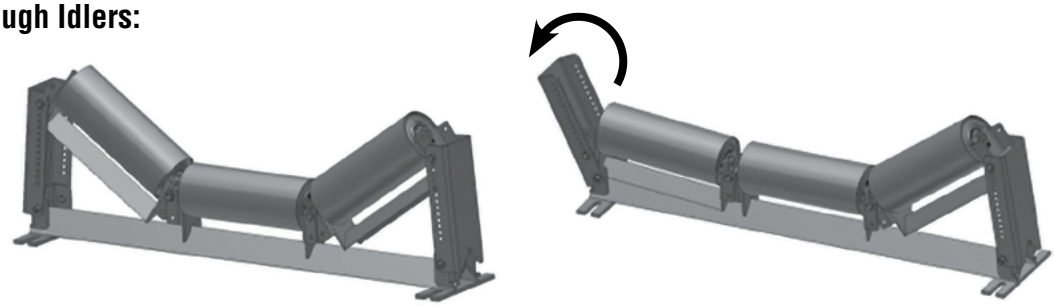
Retractable Idlers:

1. When working with Retractable Idlers, always follow operation instructions and ensure conveyor belt is stopped and conveyor is powered down with lock out/tag out safety features. Recommendation would be to ensure belt is empty prior to any work on idlers.
2. Loosen and remove bolts in frame base.

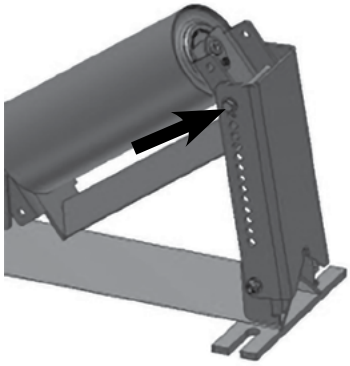


3. Frame can then be pulled apart from each side of the belt for roll removal or inspection.
4. Reverse steps to re-insert idler frame back into place, align holes in frame and secure all bolts back to recommended torque specs (70 ft-lbs).
5. Conveyor belt can then be restarted once all components are securely fastened and personnel are safely away from conveyor belt.

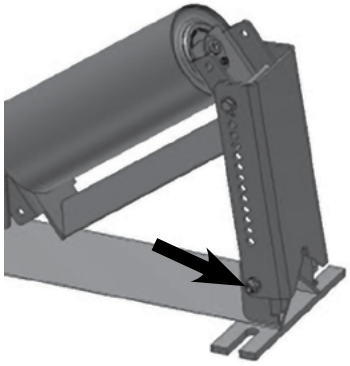
Adjustable Trough Idlers:



1. Standard Adjustable Idlers can be used to change belt trough from 5 to 35 degrees in 2 ½ degree increments. Optionally, an adjustable idler can be provided with 45 degree max trough.
2. When adjusting idler trough angle, ensure conveyor belt is stopped and conveyor is powered down with lock out/tag out safety features. If belt is still full of material, ensure it can not spill on operators when making idler adjustments. Recommendation would be to ensure belt is empty prior to any work on idlers.
3. Loosen bolts on each side of end bracket that attach to bracket on idler wing roll. When removing bolts be sure to support angled wing rolls prior to removing bolt to avoid it dropping suddenly.

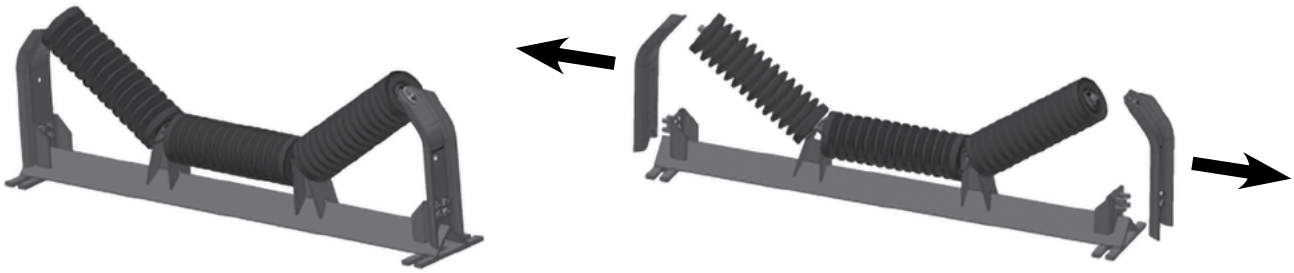


4. Loosen nut at bottom of end bracket to allow bracket to rotate and align with bracket on wing roll.

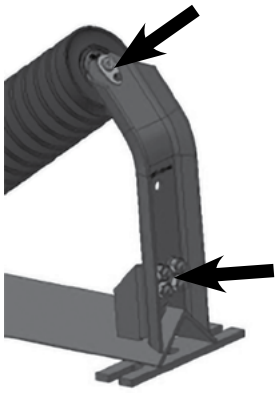


5. Wing roll and end bracket are now free to rotate and change trough angle as needed.
6. Once required angle is achieved, re-insert bolts on end bracket back into the roll end bracket to secure in place, tighten nut at bottom of end bracket and torque all bolts/nuts back down securely.
7. Conveyor belt can then be restarted once all components are securely fastened and personnel are safely away from conveyor belt.

Removable End Bracket Idlers:



1. When working with Removable End Bracket Idlers, always follow operation instructions and ensure conveyor belt is stopped and conveyor is powered down with lock out/tag out safety features. Recommendation would be to ensure belt is empty prior to any work on idlers.
2. Loosen and remove bolts at bottom of end brackets and any clips holding idler shaft to end bracket.



3. End Bracket can now be removed out the side of the idler. Support wing rolls when removing end brackets to ensure roll does not fall out of frame.
4. Remove any center clips holding rolls to center brackets.

5. Rolls can now be removed from frame.
6. After rolls have been replaced back into frame, re-insert all center clips and use bolts and nuts to re-attach end brackets to the frame securely. Once bracket is back in place end clips can be re-installed to wing roll shafts.

CAUTION: Before performing any maintenance, the circuit should be opened at the switch box, and the switch should be padlocked in the **OFF** position.

After the Idlers and belt have been installed, the system should be started while empty and checked for alignment. A properly aligned conveyor has the belt running evenly in the center of the Idlers and as a result, prevents injury to the belt edges from contact with supporting structures or other objects. If a misalignment problem exists, it is not advisable to attempt correction by readjusting the head or tail Pulley because undue strains on the Pulleys, bearings, belt, belt splice or joint or the conveyor may result. Pulleys should be carefully aligned when installed and should not be adjusted for purposes of belt training.

1. Check the alignment of the entire system by operating the conveyor with the belt completely empty. If all components are properly aligned, the belt will run evenly in the center of the Idlers.

2. If misalignment exists and the empty belt does not run true, DO NOT attempt to correct the problem by adjusting the head or tail Pulley. This causes undue stress on bearings, belt splices, and conveyor frames without correcting the problem.

   ⚠ **CAUTION**: Failure to follow these precautions may result in serious **PERSONAL** injury or damage to equipment.

   If one section of belt consistently runs out of line, either the belt is not straight or the splice is not square.

   Proper alignment is achieved by loosening the mounting bolts on several Idlers on the upstream side and skewing them slightly. When one side of an Idler is shifted ahead of the other, the belt shifts to the side that is behind. To make adjustments use the following steps:

   Loosen the mounting bolts and shift the run-out side forward until the belt runs true.

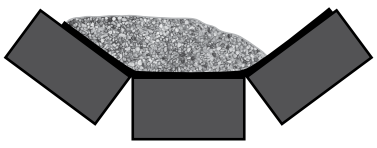
   Retighten mounting bolts, restart conveyor, and check entire system.

   Belt straightness, squareness of splices, and Idler alignment are of vital importance when a belt conveyor operates in both directions.

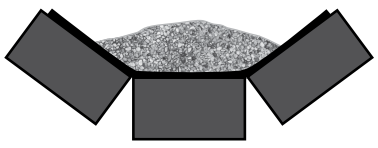
3. Training Idlers are permanently adjusted so that their upper base can swivel 10° in either direction.

   Check belt alignment under full load conditions. A properly aligned and loaded belt will run in the center of the Idlers and will NOT require corrective action from the trainers. This capability is reserved to compensate for occasional off-center belt loading, the effects of wind, concentration of lumps, and other variations which cause temporary belt misalignment.

   Recurrent of continuous misalignment is usually caused by off-center belt loading. Adjust chute so load is distributed as evenly as possible in the center of the belt.



Offset Loading
Affects Belt Alignment



Central Loading
Maintains Belt Alignment

CONVEYOR INSPECTION

Costly interruptions in production can often be avoided by a program of regularly scheduled inspections of the system and all components.

Many operators and maintenance supervisors find it economical to inspect the belt daily for breaks in the rubber covering or signs of edge rubbing. It is better to make this inspection before the system is operated and while the belt is empty.

1. After start-up, check belt loading. Chutes should deliver an even flow of material and load it centrally on the belt.
2. Check for unusual vibrations – they can loosen mounting bolts, allow Idlers to shift and cause misalignment. If this condition occurs, eliminate the cause; then realign all loose Idlers and retighten the mounting bolts.
3. Be sure spilled materials do not interfere with swiveling of training Idlers, or the free rotation of Idler rolls. Good housekeeping is essential to high operating efficiency.
4. If an Idler is sluggish, but its movement is not retarded by material buildup, a choked interior or an impending bearing failure is indicated. The latter condition is almost always signaled by an unusual noise, generally a high-pitched squeal. Sluggish, noisy, or completely stalled rolls require immediate attention because they waste power and cause excessive belt wear. If stalled rolls remain in the system, the outer shell will eventually wear through and the resulting sharp edges will severely damage the belt. When a faulty roll is discovered, tag the Idler immediately and remove it from the conveyor as soon as the system is shut down.

IDLER MAINTENANCE

Lubrication

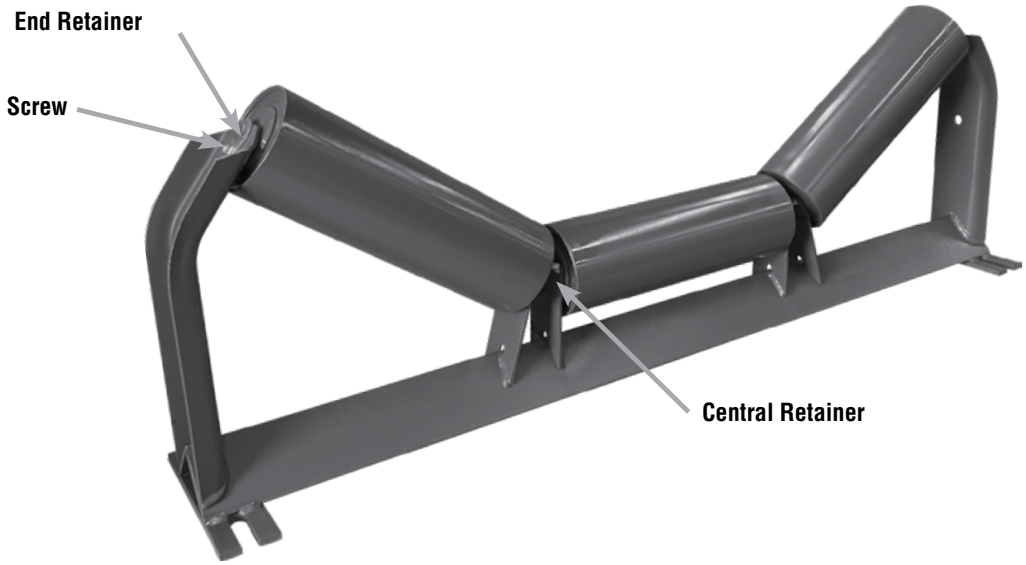
Martin Idlers are factory greased and sealed for life and therefore will not require any additional grease during their life cycle.

For high ambient temperature ranges, consult Martin Sprocket and Gear, Inc. or your lubricant supplier for recommendations.

CAUTION: Before performing any maintenance, the circuit should be opened at the switch box, and the switch should be padlocked in the **OFF** position.

1. Remove mounting bolts.
2. Tip Idler forward or backward, whichever is more convenient, until it rests on decking. If the installation does not include decking, additional precautions must be taken to prevent the Idler from falling through to the return run and causing damage or injury. A suitable plank might be used to support the Idler when it comes to rest.
3. Slide the Idler out from under the belt.

NOTE: When Idler is reinstalled, be sure it is accurately aligned and securely bolted in place.



Roll Removal

1. Remove end and center retainer clips.
2. Remove both end rolls. It may be necessary to tap the rolls to free them from the brackets. Use a rubber head mallet.
3. Lift Idler rolls out of the frame.

Roll Installation

1. Place center roll in Idler frame.
2. Install end rolls and secure with end and center retainers. NOTE: End and center retainers are an integral part of the Idler assembly and must be installed.

Type Of Failure	Probable Cause / Corrective Action
Belt Wear / Breakage	
Excessive Bottom Cover Wear	• **Material build-up (on pulleys and idlers).** Remove the accumulation and install cleaning devices, scrapers, and inverted "V" decking. • **Idlers frozen.** Free the idlers. • **Breaker strip missing or inadequate.** When service is lost, install belt with proper breaker strip. • **Insufficient traction between belt and pulley.** Increase wrap with snub pulleys. Lag drive pulley. In wet conditions use grooved lagging. Install the correct cleaning devices on belt and centrifugal switch for safety. • **Material falling between belt and pulley.** Use skirtboards properly. Remove accumulation. • **Pulley lagging worn.** Replace worn pulley lagging. Use grooved lagging for wet conditions. Repair loose bolts protruding. • **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew.** Use belt designed for specific condition. For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun.
Belt Folding Over On Itself	• **Severe pulley crowning** • **Material buildup** • **Component alignment**
Short Breaks In Carcass Parallel To Belt Edge, Start Breaks In Carcass	• **Impact of material on belt.** Redesign chute so as to reduce impact; install impact idlers, or impact bed. • **Material trapped between belt and pulley.** Install plows or scrapers on return run ahead of tail pulley.
Belt Sag	• **Insufficient belt tension or improper idler placement.** Adjust placement of idlers and adjust belt tension as necessary.
Belt Splices Are Separating	• **Particles from buildup migrate and grind into top cover and in between small imperfections in a belt splice.** Use good quality skirting at loading points and other spots where spillage is likely. Install lagging on the head and snub pulleys. Install a belt plow to prevent trapping material between the belt and tail pulley.
Vulcanized Splice Separation	• **Pulleys too small.** Use larger diameter pulley. • **Drive underbelted.** Recalculate maximum belt tensions and select correct belt. If line is over-extended, consider using two flight system with transfer point. If carcass is not rigid enough for load, install belt with proper flexibility when service is lost. • **Material build-up (on pulleys and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking. • **Excessive tension.** Recalculate tension and use appropriate belt • **Insufficient traction between belt and pulley.** Increase wrap with snub pulleys. Lag drive pulley. In wet conditions use grooved lagging. Install correct cleaning devices on belt and centrifugal switch for safety. • **Belt improperly spliced.** Retighten after running for a short while. If improperly spliced, remove old splice and resplice. Set up regular inspection schedule.
Belt Hardens Or Cracks	• **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew: use belt designed for specific condition.** For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. • **Pulleys too small.** Use a larger diameter pulley. • **Pulley lagging worn.** Replace worn pulley lagging. Use grooved lagging for wet conditions. Repair loose bolts protruding.

Type Of Failure	Probable Cause / Corrective Action
Cover Swells Or Softens In Spots	• **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew: use belt designed for specific condition.** For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. Do not over lubricate idlers.
Covers Harden Or Crack	• **Heat or chemical damage.** Use belt designed for specific condition. • **Improper storage or handling.** Follow recommendations for proper storage or handling instructions.
Cover Blisters Or Sand Blisters	• **Cover cuts or very small cover punctures allow fines to work under cover and cut cover away from carcass.** Make spot repair with vulcanizer or self-curing repair material. • **Spilled oil or grease.** Over-lubrication of idlers; improve housekeeping; reduce quantity of grease used; check grease seals.
Ply Separation	• **Insufficient traverse stiffness.** Replace with the proper belt. • **Excessive tension.** Recalculate and adjust tension. Use vulcanized splice with recommended limits. • **Pulleys too small.** Use larger diameter pulleys. • **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew: use belt designed for specific condition.** For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. • **Excessive impact on belt and splice**. • **Edge worn or broken: (permitting moisture penetration and belt shrinkage on one side).** Repair belt edge. Remove badly worn or out-of-square section and splice in new piece of belt. • **Belt edge contacting structure**. Check for obstructions. • **Belt speed too fast.** Reduce speed.
Belt Breaks At Or Behind Fasteners, Or Fasteners Tear Loose	• **Belt improperly spliced or wrong fasteners.** Use fasteners recommended by the manufacturer. Retighten after running for a short while. If improperly spliced remove old splice and resplice. Set up regular inspection schedule. • **Pulleys too small.** Use a larger diameter pulley. • **Excessive tension.** Recalculate and adjust tension. Use vulcanized splice with recommended limits. • **Pulley lagging worn.** Replace worn pulley lagging. Use grooved lagging for wet conditions. Repair loose bolts protruding. • **Material falling between belt and pulley.** Use skirtboards properly. Remove accumulation. • **Drive underbelted.** Recalculate maximum belt tensions and select correct belt. If line is over-extended, consider using two flight system with transfer point. If carcass is not rigid enough for load, install belt with proper flexibility when service is lost. • **Counterweight too heavy.** Recalculate weight and adjust counterweight accordingly. Reduce take-up tension to point of slippage; retighten slightly. • **Differential speed wrong on dual pulleys.** Make necessary adjustment and observe operation closely.
Excessive Top Cover Wear, Uniform Around Belt	• **Dirty, stuck, or misaligned return rolls.** Remove accumulations; install cleaning devices; use self-cleaning return rolls; improve maintenance and lubrication. • **Cover quality too low.** Replace with belt of heavier cover gauge or higher quality rubber or other elastomer. • **Material spillage and build-up.** Improve loading and transfer conditions; install cleaning devices; improve maintenance. • **Off-center loading or poor loading.** Adjust chute to place load on center of belt; discharge material in direction of belt travel at or near belt speed. • **Excessive sag between idlers causing load to work and shuffle on belt as it passes over idlers.** Increase tension if unnecessarily low; reduce idler spacing.

Type Of Failure	Probable Cause / Corrective Action
Excessive Belt Stretch	• **Tension too high.** Increase speed, same tonnage, same speed; improve maintenance to remove friction and replacement of damaged idlers; decrease tension by increasing arc of contact or go to lagged pulley; reduce CWT to minimum amount. Use vulcanized splice with recommended limits. • **System underbelted.** Recalculate belt tensions and select proper belt. Recalculate maximum belt tensions and select correct belt. If line is over-extended, consider using two flight system with transfer point. If carcass is not rigid enough for load, install belt with proper flexibility when service is lost. • **Build-up of material on idlers.** Remove accumulation; improve maintenance. Install scrapers or other cleaning devices. • **Counterweight too heavy.** Lighten counterweight to value required by calculations. • **Differential speed wrong on dual pulleys.** Make necessary adjustment and observe operation closely. • **Insufficient counterweight travel.** Check for recommended minimum distances. • **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew.** Use belt designed for specific condition. For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun.
Belt Breaks At Or Behind Fasteners: Fasteners Pull Out	• **Fastener plates too long for pulley size.** Replace with smaller fasteners; increase pulley size. • **Wrong type of fastener, fasteners too tight or too loose.** Use proper fastener and splice technique; set up schedule for regular fastener inspection. • **Tension too high for fasteners.** Use vulcanized splice. • **Pulleys too small.** Use larger diameter pulleys. • **Interference from belt scrapers.** Adjust belt scrapers. • **Belt carcass too light.** Select stronger carcass.
Belt's Top Cover And Belt Edges Are Wearing Excessively	• **Build-up on the snub pulley and return idlers often wears the top cover.** Reduce the wear by installing rubber or plastic sleeves on the return idlers and smooth lagging on the snub pulley. • **Improper load can also damage the top cover and belt edges.** • **Off-center loading or poor loading.** Adjust chute to place load on center of belt; discharge material in direction of belt travel at or near belt speed. • **Create a stable, positive seal between the chute's bottom edge** (or skirtboard) and the belt by using impact rollers or slider beds below the belt, which shape the belt into a trough. Use good-quality skirting along the belt conveyor to prevent spillage. Avoid using old belt scraps to make the skirting because they can wear your conveyor belt.
Excessive Top Cover Wear, Grooving, Gouges, Rips, Ruptures, And Tears Or Stripping Of Top Cover	• **Skirt boards improperly adjusted or of wrong material.** Adjust skirt board supports to minimum 1" between metal and belt with gap increasing in direction of belt travel; use skirt board rubber (not old belt). • **Relative loading velocity too high or too low.** Adjust chutes or belt speed. Consider use of impact idlers. Observe operation closely. • **Load jams in chute.** Redesign chute for proper angle and width. Feed should be in direction of belt travel and at belt speed, centered on the belt. Control flow with feeders, chutes and skirtboards. • **Material hanging up in or under chute.** Improve loading to reduce spillage; install baffles; widen chute. • **Impact of material on belt.** Reduce impact by improving chute design; install impact idlers, or impact bed. • **Sharp edges of material or tramp iron coming in contact with cover.** Use jingle bars; impact idlers; magnetic removal equipment. • **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew: use belt designed for specific condition.** For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. • **Breaker strip missing or inadequate.** When service is lost, install belt with proper breaker strip. • **Sticking or frozen idlers.** Free idlers and improve maintenance and lubrication.

Type Of Failure	Probable Cause / Corrective Action
Carcass Fatigue At Idler	• **Improper transition between troughed belt and terminal pulleys.** Adjust transition. • **Severe convex (hump) vertical curve.** Decrease idler spacing in curve, increase curve radius. • **Excessive forward tilt of trough rolls.** Reduce forward tilt of idlers to no more than 2° from vertical. • **Excess gap between idlers rolls.** Replace with heavier belt. • **Insufficient transverse stiffness.** Replace with the proper belt. • **Excessive sag between idlers causing load to work and shuffle on belt as it passes over idlers.** Increase tension if unnecessarily low; reduce idler spacing.
Fabric Decay, Carcass Cracks, Gouges, Ruptures, Soft Spots	• **Excessive impact of material on belt or fasteners.** Use correctly designed chutes and baffles. Make vulcanized splices. Install impact idlers. Where possible, load fines first. Where material is trapped under skirts, adjust skirtboards to minimum clearance or install cushioning idlers to hold belt against skirts. • **Material falling between belt and pulley.** Use skirtboards properly. Remove accumulation. • **Breaker strip missing or inadequate.** When service is lost, install belt with proper breaker strip. • **Drive underbelted.** Recalculate maximum belt tensions and select correct belt. If the line is over-extended, consider using two flight system with transfer point. If carcass is not rigid enough for load, install belt with proper flexibility when service is lost. • **Damage by acids, oils, chemicals, or deterioration by heat, abrasives or mildew.** Use belt designed for specific condition. For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. Do not over lubricate idlers.
Belt Cupping - Old Belt (Was Ok When New)	• **Spilled oil or grease.** Over-lubrication of idlers; improve housekeeping; reduce quantity of grease used; check grease seals. • **Heat or chemical damage.** Use belt designed for specific condition. • **Severe pulley crowning**. Replace pulley. • **Poor belt construction**. Replace belt. • **Belt too Elastic (excessive tension)**. Replace belt.
Transverse Breaks At Belt Edge	• **Belt edges folding up on structure.** Idlers or pulleys out-of square with center line of belt: readjust idlers in affected area. Conveyor frame or structure crooked: straighten in affected area. Idler stands not centered on belt: readjust idlers in affected area. Install limit switches; provide more clearance. • **Improper transition between troughed belt and terminal pulleys.** Adjust transition in accordance with belt manufacturers recommendations. • **Severe convex (hump) vertical curve.** Decrease idler spacing in curve; increase curve radius.
Excessive Edge Wear, Broken Edges	• **Off-center loading or poor loading.** Adjust chute to place load on center of belt; discharge material in direction of belt travel at or near belt speed. Control flow with feeders, chutes and skirtboards. • **Belt strained (or elongated on one side).** Allow enough time for new belt to “break in”. If belt does not break in properly or is not new, remove strained section and splice in new piece. • **Bowed belt.** For new belt this condition should disappear during break-in; in rare instances belt must be straightened or replaced; check storage and handling of belt rolls. • **Damage by acids, chemicals, oils, or deterioration by abrasives, heat or mildew.** Use belt designed for specific condition. For abrasive materials working into cuts and between plies, repair with cold pack or with permanent repair patch. Seal metal fasteners or replace with vulcanized step splice. Enclose belt line for protection against rain, snow, or sun. Do not over lubricate idlers. • **Material spillage and build-up.** Improve loading and transfer conditions; install cleaning devices; improve maintenance. • **Belt improperly spliced.** Resplice using proper method as recommended by belt manufacturer. • **Belt hitting structure.** Install training idlers on carrying and return run.

Type Of Failure	Probable Cause / Corrective Action
Pulley / Drive Problems	
Severe Pulley Cover Wear	• **Sticking idlers.** Free idlers and improve maintenance and lubrication. • **Slippage on drive pulley.** Increase tension through screw take-up or add counterweight; lag drive pulley; increase arc of contact. • **Material spillage and build-up.** Improve loading and transfer conditions; install cleaning devices; improve maintenance. • **Material trapped between belt and pulley.** Install plows or scrapers on return run ahead of tail pulley. • **Bolt heads protruding above lagging.** Tighten bolts; replace lagging; use vulcanized-on lagging. • **Excessive forward tilt of trough rolls.** Reduce forward tilt of idlers to no more than 2° from vertical.
Tracking Problem	
Belt Runs To One Side Throughout The Entire Length At Specific Idler	• **Idlers or pulley shaft out of square with center line of conveyor.** Realign and install limit switches for greater safety. Check conveyor manufacturer's manual or guide. • **Improperly placed idlers.** Relocate idlers or insert additional idlers spaced to support belt. • **Material build-up (on pulley and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking.
Erratic Tracking - Belt Runs Off-Line At Intermittent Points	• **Off-center loading.** Adjust chute and loading conditions so as to place load in the center of belt. • **Idlers/pulleys misaligned.** • **Insufficient pulley crowning.** • **Material buildup.** • **Belt is too stiff to train.** Use self-aligning idlers. Increase tension/conforms to crowns. Use more flexible belt on replacement. • **Tilt troughing idlers forward, but not over 2 degrees.** Use more troughable belt.
Belt Runs Off At Tail Pulley	• **Counterweight too light.** Recalculate weight required and adjust or add to counterweight or screw takeup accordingly. • **Belt running off-center around the tail pulley and through the loading area.** Install training idlers on the return run prior to tail pulley. • **Material spillage and build-up.** Improve loading and transfer conditions; install cleaning devices; improve maintenance. • **Idlers or pulleys out-of square with center line of belt.** Readjust idlers in affected area. • **Pulley lagging worn.** Replace worn pulley lagging. Use grooved lagging for wet conditions.
Belt Slips On Starting	• **Insufficient traction between belt and pulley.** Lag drive pulley; increase belt wrap; install belt cleaning devices. • **Counterweight too light.** Add counterweight or increase screw take-up tension to value determined from calculations. • **Pulley lagging worn.** Replace pulley lagging. • **Pulleys too small.** Use larger diameter pulleys. • **Improper initial positioning of counterweight in its carriage causing apparent excessive belt stretch.** Check for recommended initial position. • **Insufficient counterweight travel.** Check for recommended minimum distances.
Belt Mistracks At Head Pulley	• **Idlers/pulleys misaligned.** Realign and install limit switches for greater safety. Check conveyor manufacturer's manual or guide. • **Pulley lagging worn.** Replace worn pulley lagging. Use grooved lagging for wet conditions. Repair loose bolts protruding. • **Material buildup (on pulleys and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking. • **Improperly placed idlers.** Relocate idlers or insert additional idlers spaced to support belt. • **Off-center loading.**

Type Of Failure	Probable Cause / Corrective Action
Belt Runs Off At All Points Of The Line	• **Skirts incorrectly placed.** Install skirtboards so that they do not rub against belt. • **Improper Loading.** Feed should be in direction of belt travel and at belt speed, centered on the belt. Control flow with feeders, chutes and skirtboards. • **Idlers or pulley shaft out of square with center line of conveyor.** Realign and install limit switches for greater safety. Check conveyor manufacturer's manual or guide. • **Material build-up (on pulleys and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking. • **Belt strained (or elongated on one side).** Allow enough time for new belt to "break in". If belt does not break in properly or is not new, remove strained section and splice in new piece. • **Improperly placed idlers.** Relocate idlers or insert additional idlers spaced to support belt.
Belt Mistracks At Tail Pulley	• **Insufficient belt tension.** • **Idlers/pulley misaligned.** Realign and install limit switches for greater safety. Check conveyor manufacturer's manual or guide. **Idlers seized.** Free the idlers. • **Material build-up (on pulley and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking. • **Insufficient pulley crowning.** • **Counterweight too light:** recalculate weight and adjust counter weight or screw take-up accordingly. • **Improper Loading.** Feed should be in direction of belt travel and at belt speed, centered on the belt. Control flow with feeders, chutes and skirtboards.
One Section Runs Off Line At All Conveyor Points	• **Pulleys not parallel, level, square.** • **Insufficient pulley crowning.** • **Damage by chemicals, heat, mechanical components.** • **Belt camber.** Avoid telescoping belt rolls or storing them in damp locations. A new belt should straighten out when "broken in" or complete system must be reinspected. • **Improper splice procedure/technique.** Square ends/resplice. Use fasteners recommended by the manufacturer. Retighten after running for a short while. If improperly spliced, remove old splice and resplice. Set up regular inspection schedule. • **Side Loading.** Load in direction of belt travel. • **Edge worn or Broken (permitting moisture penetration and belt shrinkage on one side).** Repair belt edge. Remove badly worn or out-of-square section and splice in new piece of belt.
Belt Runs True When Empty, Crooked When Loaded	• **Off-center loading or poor loading.** Adjust chute to place load on center of belt; discharge material in direction of belt travel at or near belt speed. • **Variations in nature and formation of load.** Use notched chute to keep load peak in exact center of belt. • **Belt not making good contact with all idlers.** Adjust height so all idlers contact belt.
Belt Runs To One Side At Given Point On Structure	• **Build-up of material on idlers.** Remove accumulation; improve maintenance. Install scrapers or other cleaning devices. • **Sticking idlers.** Free idlers and improve maintenance and lubrication. • **Idlers or pulleys out-of square with center line of belt.** Readjust idlers in affected area. • **Conveyor frame or structure crooked.** Straighten in affected area. • **Idler stands not centered on belt.** Readjust idlers in affected area. • **Structure not level.** Level structure in affected area.

Type Of Failure	Probable Cause / Corrective Action
Belt Mistracks And Runs Off At The Head Pulley	• **Spillage and worn lagging can cause material to build-up between the head pulley and belt.** Prevent the spillage and buildup by installing a slider-bedskirt board system at the loading point and a belt scraper at the head pulley. If your conveying conditions are wet and sticky, use grooved lagging on the head pulley; the grooves repel water and help prevent buildup on the belt. Improve maintenance. • **Idlers or pulleys out-of square with center line of belt.** Readjust idlers in affected area. • **Idler stands not centered on belt.** Readjust idlers in affected area.
Belts Runs To One Side Throughout The Entire Length At Specific Idler	• **Idlers or pulley shaft out of square with center line of conveyor.** Realign and install limit switches for greater safety. Check conveyor manufacturer's manual or guide. • **Improperly placed idlers.** Relocate idlers or insert additional idlers spaced to support belt. • **Material build-up (on pulley and idlers).** Remove accumulation and install cleaning devices, scrapers, and inverted "V" decking.
Belt Slips	• **Insufficient traction between belt and pulley.** Lag drive pulley - in wet conditions use grooved lagging. Increase belt wrap with snub pulleys; install belt cleaning devices and centrifugal switch for safety. • **Pulley lagging worn.** Replace pulley lagging. Ceramic lagging provides an excellent solution when conventional rubber lagging fails to correct belt slippage and premature wear. • **Counterweight too light.** Add counterweight or increase screw take-up tension to value determined from calculations. • **Material spillage and build-up.** Improve loading and transfer conditions; install cleaning devices; improve maintenance. • **Sticking or frozen idlers.** Free idlers and improve maintenance and lubrication. • **Pulleys too small.** Use larger diameter pulleys.
All Portions Of Conveyor Belt Running To One Side At A Given Point On Structure	• **One or more idlers immediately preceding trouble point not at right angles to the direction of belt travel.** Advance, in the direction of belt travel, the end of the idler to which the belt has shifted. Square idlers. • **Conveyor frame or structure crooked.** Stretch string along edge to determine extent and make correction. • **One or more idler stands not centered under belt.** Center them. Same as above. • **Sticking idlers.** Clean and lubricate. • **Belt runs off terminal pulley.** Check terminal pulley assignment. Check alignments of idlers approaching terminal pulley. • **Build-up of material on idlers.** Clean them. Install cleaning device. • **Structure not level and belt tends to shift to low side.** Level structure.
Particular Section Of Belt Runs To One Side At All Points Of Conveyor	• **Belt not joined squarely.** Remove affected splice and resplice. • **Bowed belt.** For new belt this condition should disappear during break-in; in rare instances belt must be straightened or replaced; check storage and handling of belt rolls. • **Worn edge.** "Press edge".
Belt Runs To One Side For Long Distance Or Entire Length Of Conveyor	• **Belt running off-center around the tail pulley and through the loading area.** Install training idlers on the return run prior to tail pulley. • **Off-center loading or poor loading, the result of buildup in your chutes**. Install non-stick, wear-resistant (rubber for example) chute liners to center and evenly distribute the load on the belt. Choose the liner material carefully to ensure it can resist wear from contacting your conveyed material. Adjust chute to place load on center of belt; discharge material in direction of belt travel at or near belt speed. • **Build-up of material on idlers.** Remove accumulation; improve maintenance. Install scrapers or other cleaning devices. • **Idlers or pulleys out-of square with center line of belt.** Readjust idlers in affected area. • **Conveyor frame or structure crooked.** Straighten in affected area. • **Idler stands not centered on belt.** Readjust idlers in affected area.

Phone: 817.258.3000

Fax: 817.258.3333

martinsprocket.com

COPYRIGHT® 2024 • MARTIN SPROCKET & GEAR, INC. • ALL RIGHTS RESERVED • IOM MANUAL