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”

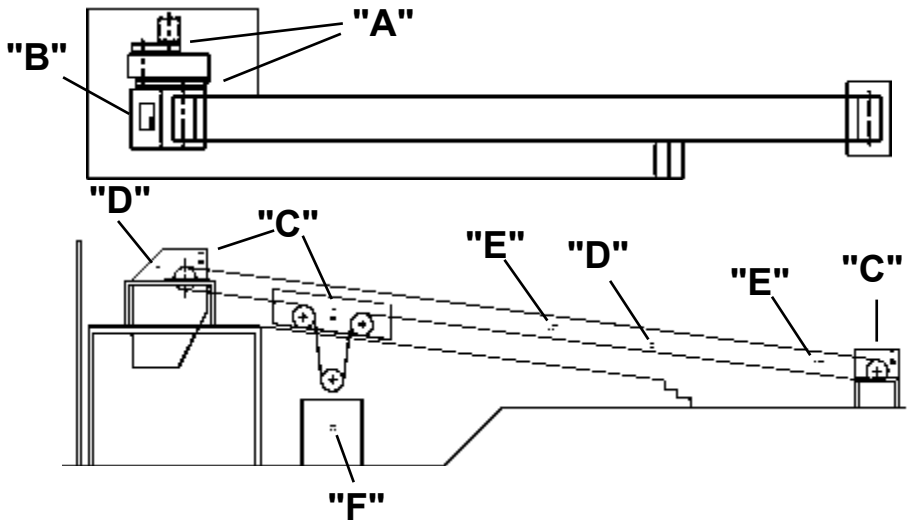
(SPACE UP TO A MAXIMUM OF 50 FT CENTERS (WALKWAY SIDES))

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



CEMA Safety Labels Placement Guidelines

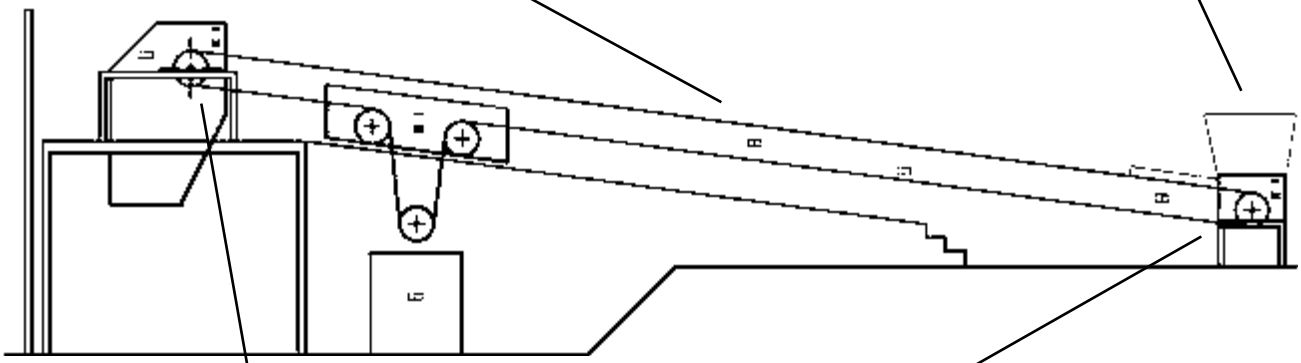
Product: Bulk Handling Equipment

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**

INSTALLATION

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.

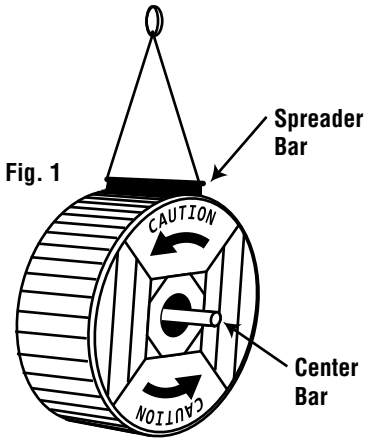


Fig. 1

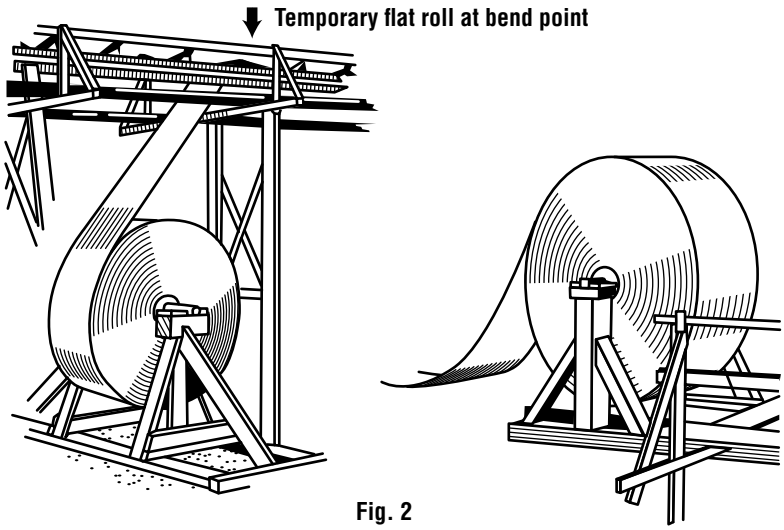


Fig. 2

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.

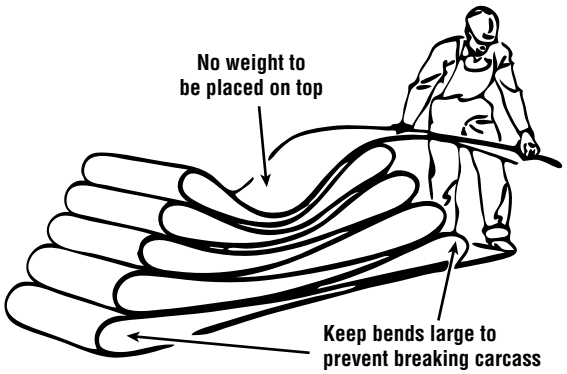


Fig. 3
Reefing the Belt

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

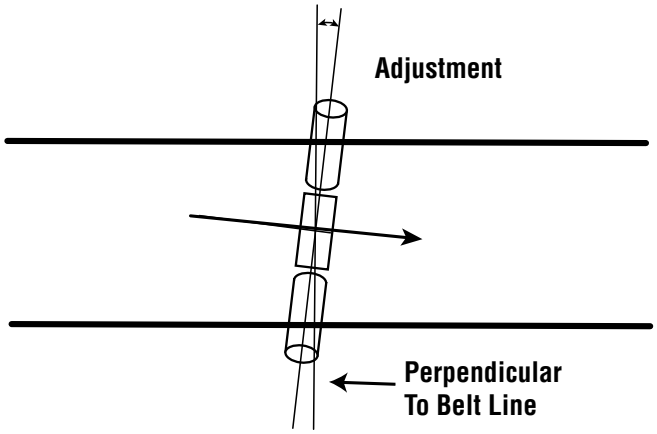


Fig. 5

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.

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.