



Conveyor Installation and Maintenance Manual

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SECTION: 1 INTRODUCTION

How To Use This Manual

This manual is supplied to assist you in maintaining and servicing MODULAR CONVEYOR EXPRESS equipment. It is essential, for safe and efficient system operation, that the information and guidelines presented here are properly understood and implemented. Following is a brief description of the information contained in each section:

1. **Introduction:** Basic information about the manual, the system, and trademarks (if any) used in the manual.
2. **Safety:** Safety precautions for conveyor maintenance.
3. **Equipment:** Mechanical information about the operation and maintenance of the various types of equipment installed in the conveyor system.
4. **Preventive Maintenance Guide:** One of the most important factors in the overall cost effectiveness of your material handling system is that of preventive maintenance; that is, eliminating the cause of potential trouble before the trouble occurs. This concept makes it possible to perform maintenance and repair operations on a predetermined schedule rather than according to chance. Implementing an effective preventive maintenance program on your MODULAR CONVEYOR EXPRESS equipment serves to increase its dependability, longevity, and efficiency, all of which add up to lower operating costs.
5. **Troubleshooting:** Despite the best operating techniques and preventive maintenance program, machines sometimes do fail. This section contains suggested step-by-step methods to aid in detecting the cause or causes of these failures.

Note: You must have a basic knowledge of conveyor equipment operation and/or maintenance, and an honest concern for the condition of this material handling system, in order to properly use and understand the information presented in this manual.

Observe the equipment when it is functioning properly in order to detect failure and/or to perform maintenance or adjustment on the equipment. Where applicable, follow manufacturer's recommendations for specific components supplied as part of the material handling system.

Equipment Warranty

- A. MODULAR CONVEYOR EXPRESS warrants the items supplied by MODULAR CONVEYOR EXPRESS shall be suitable for the intended use, and shall be free of defects in material and workmanship, at the time of acceptance of the work, for a period of twelve months.
- B. THERE ARE NO WARRANTIES, EXCEPT OF TITLE, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE EXCEPT AS EXPRESSLY SET FORTH IN THIS ARTICLE.
- C. MODULAR CONVEYOR EXPRESS's liability for breach, warranty, or otherwise, is limited to the following actions:
 - 1. Structural members: Defective or non-conforming structural members will be repaired or replaced by MODULAR CONVEYOR EXPRESS at PURCHASER'S site.
 - 2. Items of MODULAR CONVEYOR EXPRESS's design or manufacture: Defective components will be repaired or replaced when same are returned to MODULAR CONVEYOR EXPRESS, F.O.B. Oconto, Wisconsin.
 - 3. Items not of MODULAR CONVEYOR EXPRESS's design or manufacture: MODULAR CONVEYOR EXPRESS's liability for defects in material or workmanship for computer hardware, peripherals, software developed by third parties, or other items not designed or manufactured by MODULAR CONVEYOR EXPRESS, which are incorporated into the System, shall be limited to that of the vendor thereof.
 - 4. MODULAR CONVEYOR EXPRESS-developed controls: MODULAR CONVEYOR EXPRESS's liability for defects is limited to the correction of demonstrable defects that are defined and documented by the PURCHASER.
- D. MODULAR CONVEYOR EXPRESS shall be relieved of any obligations under the foregoing warranty as to any items which:
 - 1. Have not been properly maintained or are not maintained to the current support level in accordance with MODULAR CONVEYOR EXPRESS's and manufacturer's recommended procedures and written instructions.
 - 2. Have not been operated in accordance with MODULAR CONVEYOR EXPRESS's or manufacturer's recommended procedures and written instructions.
 - 3. Have been modified by persons other than MODULAR CONVEYOR EXPRESS (except where prior approval has been granted by MODULAR CONVEYOR EXPRESS).
- E. MODULAR CONVEYOR EXPRESS shall be given access to make warranty repairs.
- F. PURCHASER shall notify MODULAR CONVEYOR EXPRESS, in writing, of all warranty claims, defining the nature, extent and effect of the defect.

SECTION: 2 SAFETY

General

Note: The safety procedures/policies listed in this chapter are not intended to address fire-related considerations. Your system must comply with any applicable national, state, and local codes.

Follow safety precautions for industrial work at all times. The information in this chapter includes guidelines specified in the latest issue of the American National Standard Institute (ANSI) booklet entitled *Safety Standards for Conveyors and Related Equipment B20.1-2012*. We have included additional precautions that are to be observed in accordance with any ANSI regulations that are applicable.

With any piece of industrial equipment, conditions exist that might cause injury to you or your co-workers. Because it is not possible to describe each potentially hazardous situation that might develop, you must be alert at all times for unsafe conditions. To avoid injury, use maximum possible care, common sense, and adhere to all safety standards.

Until you are appropriately trained, you are not authorized to operate, install, maintain, or modify the system. See your supervisor about receiving this training or authorization before you operate, install, maintain, or modify the material handling system.

Take special care while maintaining and inspecting electrical equipment and devices. All personnel working on or around the system should be aware of, and adhere to, all **CAUTION**, **DANGER**, and **WARNING** signs. These signs are posted to reduce the risk of injury to all personnel. Maintain signs in a legible condition. Contact your supervisor to post additional safety signs if you feel they are necessary.

Follow these conveyor safety rules, as well as specific regulations and guidelines listed in this publication:

Conveyor Safety Rules

- **DO NOT** touch moving conveyor parts.
- **DO NOT** walk, ride or climb on the conveyor.

- **DO NOT** operate the conveyor with chain guards or other protective guards removed.
- Keep jewelry, clothing, hair, etc., away from the conveyor.
- Know the location and function of all start/stop devices and keep those devices free from obstruction.
- Clear all personnel from the equipment before starting the conveyor.
- **DO NOT** attempt to clear product jams while the conveyor is running.
- Allow only trained and authorized personnel to maintain or repair conveyor equipment.
- **DO NOT** load the conveyor beyond specified design limits.
- **DO NOT** attempt to make repairs to the conveyor while it is running.
- **DO NOT** modify equipment without checking with the manufacturer.
- **DO NOT** operate or perform maintenance on equipment when taking any type of drug or sedative, when under the influence of alcohol, or over-fatigued.

CAUTION

When a conveyor is stopped for maintenance or repair purposes, you must lock out or tag out the starting devices, prime movers, or powered accessories in accordance with a formalized procedure designed to protect everyone involved with the conveyor against an unexpected restart. Also, alert all personnel to the hazard of stored energy, which can exist after the power source is locked out.

For additional information, refer to the latest issue of ANSI Z244.1-2012, American National Standard for Personnel Protection - *Lockout/Tagout of Energy Sources - Minimum Safety Requirements*. Also, OSHA 29CFR Part 1910.147 “*Control of Hazardous Energy sources (Lockout/Tagout)*”, which includes requirements for release of stored energy.

Mechanical Maintenance Safety

Lubricate conveyors when they are not in motion, wherever practical. Only trained personnel who are aware of the hazard of the conveyor in motion should be permitted to lubricate a conveyor that is operating.

After you lubricate the conveyor, check to make sure that none of the lubricants or other process liquids have spilled or dropped onto the floor. These liquids create a hazardous condition. If you notice a drip, install a drip pan or other means of eliminating the hazard.

Electrical Maintenance Safety

When an equipment problem occurs, the first priority is to ensure that power is disconnected from the affected area, as well as from the control panel where troubleshooting and repairs are performed.

Once you verify that power is locked out, make sure you inform other personnel in the area of the situation so they do not unexpectedly restore power.

After you inform your co-workers, recheck the power supply to ensure that power is disconnected in the affected control panel. Using insulated fuse pullers only, remove fuses and check terminal strips for current-carrying wires. Before you perform any repairs with an exposed conductor or terminal, use an approved voltmeter to check for continuity to ground and continuity between other current-carrying conductors.

When you perform any kind of maintenance or repair involving electrical components, follow the guidelines listed below:

Safety Guidelines

- **NEVER** reset a circuit breaker or replace an open fuse before determining and correcting the cause of the circuit interruption.
- **NEVER** bypass or use a jumper to replace any limit switch, fuse, circuit breaker, or other circuit protection or safety device.

- **NEVER** replace an open fuse with another that is not rated at the proper current and voltage. Always double-check correct fuse specifications rather than replace the open fuse with one of the same current and voltage rating.
- **NEVER** rest tools on motors, transformers, terminal strips, or other control panel or electrical components. All tools used should be kept in a tool box or pouch.
- **NEVER** restore power or restart equipment before verifying that all tools, spare parts, etc., are removed from the work area and are safely stored.
- **NEVER** restore power or restart equipment before verifying that ALL personnel are aware of the condition and are safely clear of the equipment.
- **ALWAYS** replace any safety devices and guards, removed during maintenance or repair, before you restore power or restart equipment.
- **ALWAYS** use extreme caution and follow recommended safety procedures while you perform any electrical inspection or maintenance operations.

Application Safety

The equipment used in your system is designed to convey specified commodities or materials within a certain rate and speed. It might not be possible to safely use the equipment outside of the intended capacities or speeds. Check with your supervisor if you have questions regarding the safe operation of the equipment.

Backstop Devices

Provide anti-runaway, brake, or backstop devices on all incline, decline, or vertical conveyors with which the effect of gravity might allow uncontrolled lowering of load if that lowering would cause injury to you or co-workers.

Headroom

When equipment is installed above exit passageways, aisles, or corridors, provide a minimum clearance of 6 feet 8 inches (measured vertically from the floor or walking surface to the lowest part of the conveyor or guards). Where providing the minimum clearance of 6 feet 8 inches through an emergency exit will impair system function, provide alternate passageways. It is permissible, however, to allow passage under conveyors with less than 6 feet 8 inches clearance from the floor, for other than emergency exits, if a suitable warning indicates low headroom.

Guarding

If necessary to protect personnel from hazards, guard by location or position all exposed moving machinery parts that present a hazard to personnel at their workstations.

When a conveyor passes over a walkway, roadway, or work station, it is considered to be guarded solely by location or position if all moving parts are at least 8 feet above the floor or walking surface, or are otherwise located so the personnel cannot inadvertently come in contact with hazardous moving parts.

Controls Safety

Electrical Code

All electrical installations and wiring must conform to the National Electrical Code (Article 670 and other applicable articles) published by the National Fire Protection Association and approved by the American National Standards Institute, Inc.

Control Stations

Arrange control stations so that equipment operation is visible from the stations and clearly mark or label each station to indicate its function.

The emergency stop devices installed with your system are designed so that they cannot be overridden from other locations.

Keep the area around your control station clear.

Remove all miscellaneous equipment (such as inactive and unused actuators, controllers, and wiring) from

control stations and panel boards, as well as obsolete diagrams, indicators, control labels, and other material that might confuse the operator.

Safety Devices

All safety devices, including wiring of electrical safety devices, operate in a “fail-safe” manner; that is, if power, or the device fails, a hazardous condition will not result.

Emergency Stops and Restarts

In case of an emergency stop, first determine the cause of the stoppage and correct the situation that warranted the stop. To resume operation after a stoppage, manually reset or start at the location where the emergency stop occurred.

CAUTION

Before you try to correct the situation, lock out or tag out the starting device, unless it must be operated to determine the cause or to safely remove the stoppage.

For additional information, refer to the latest issue of ANSI Z244.1-2012, American National Standard for Personnel Protection Lockout/Tagout of Energy Sources - Minimum Safety Requirements.

Transfer, Loading and Discharge Points

At transfer, loading, and discharge points, prevent unconfined and uncontrolled free-fall of material resulting from flooding, ricocheting, overloading, trajectory, leakage, or a combination thereof, if the material would create a hazard to personnel.

Note: The safety standards outlined in this section have NOT been exactly duplicated from the latest issue of the ANSI booklet, Safety Standards for Conveyors and Related Equipment B20.1-2012. We recommend that all operators and maintenance personnel review this booklet, which you can obtain by contacting the American Society of Mechanical Engineers at the following address:

*American Society of Mechanical Engineers United
Engineering Center
345 East 47th Street
New York, NY 10017*

SECTION: 3 EQUIPMENT

Conveyor Installation Instructions

Note: All equipment must be installed to conform to the National and Local Safety Codes. In the event that any caution or warning labels affixed to the equipment are damaged in shipping or obscured from vision because of the position of the equipment on site, you should order the appropriate replacement labels before operating the equipment.

1. All components of the system are numbered for assembly. Proper assembly is accomplished by merely matching the numbers. The numbers are marked on the conveyor sections.
2. Having laid out the conveyor to match the assembly numbers, connect all joints, carefully check conveyor for correct elevation and level, then tighten the fasteners to secure the section being installed.
3. As the system is assembled, check all fasteners to ensure that they are secure, even those that are not connected with the assembly of the sections.
4. Unless otherwise noted, all gearboxes on the system will have been filled with oil prior to testing and shipping the conveyor. Check each gearbox to ensure correct oil level.
5. All bearings have been greased prior to testing and shipping the conveyor, and should not require further lubrication at this time, unless conveyor has been stored for a long period. In the event that the system has been exposed to abrasive construction materials (cement, sand, brick dust, etc.), the system should be cleaned and all abrasive debris removed before starting the system.
6. When installing the carrying chains, extreme attention should be paid to attaining the correct catenary "sag" at the drive end. Weekly inspections of catenary "sag" at all drive ends are recommended. While running, catenary sag should be approximately 3"-4" below the bottom of the sprocket.

Operational Safety

CAUTION
Read the following BEFORE
operating equipment!

- Prior to "starting" equipment, make sure that all personnel are clear of equipment and that all foreign objects and tools have been removed.
- All guards shall be in place before operating equipment.
- All starting and stopping devices should be clearly marked. The area around these devices should be kept free of obstructions to permit ready access to them and a clear view of them at all times.
- The area around all loading and unloading points on equipment should be kept clear of obstructions at all times so that the operator working at these points has an unobstructed view of the equipment.
- **DO NOT** "drop" or "shock" load cases onto conveyor.
- **NO** "riding" shall be permitted on any equipment.
- Maintenance work should **NOT** be done while equipment is in operation. If it is necessary to operate the equipment while servicing it, special safety provisions shall be used.
- When equipment is stopped for servicing purposes, the starting device shall be locked and/or tagged out by the person servicing the equipment and it shall be restarted only by the person who locked and/or tagged the equipment.
- Before restarting equipment that has stopped due to an overload, an inspection of the equipment shall be made and the problem causing the overload corrected before restarting the equipment.
- The starting device shall be locked and/or tagged out before any attempt is made to remove the cause of an overload.
- No overload or safety device shall be removed from the equipment. Provisions should be made to prevent anyone except a competent authorized person from adjusting or tampering with the adjustment of such devices.

- All personnel working on or near equipment shall be instructed in the location and operation of all stopping devices.
- At no time should equipment be used for a purpose beyond its design limitations.
- All persons working with, or in the vicinity of, the equipment should also be instructed regarding the potential danger of any exposed moving part of the equipment that is not guarded.

SECTION: 4 PREVENTIVE MAINTENANCE GUIDE

Introduction

MODULAR CONVEYOR EXPRESS conveyors are designed to operate with a minimum of maintenance. Downtime on any part of a conveyor system involves both time and money. Certainly not all breakdowns or failures can be detected before they occur, however, many can be prevented if you follow a regular maintenance program. When you install new equipment, you should establish a schedule of preventive maintenance. The preventive maintenance procedures outlined in this manual provide an easy means of determining the operational status of the equipment. The preventive maintenance procedures enable you to identify possible trouble areas, so that the suspect condition does not deteriorate to the point of equipment failure.

Preventive Maintenance Schedule

Purpose

The objective of the preventive maintenance schedule is to ensure that the equipment performs at maximum efficiency over a long period of time. This helps to eliminate costly repairs.

Standardized procedures ensure effective control over maintenance operations and enable you to compare equipment in order to evaluate the maintenance program.

Preventive maintenance procedures are applicable to all equipment locations.

Note: Replace any faulty parts immediately upon discovery during scheduled inspections and maintenance.

Slow Speed Conveyor Drive Chains (Motor Gearbox to Head Shaft)

Correct lubrication is essential to obtain long life of the chain drive. At slow speeds, good results are obtained by periodic lubrication. Oil of medium consistency may be applied with a brush when the chain is running slowly.

For drives exposed to wet conditions and that operate at slow speed, a lubricant of grease consistency can be used.

Lubrication and Care of Sealed Ball Bearings

Rotating drive, idler and take-up shafts have sealed self-aligning ball bearings.

Ball bearing units are shipped pre-lubricated with grease chosen for chemical and mechanical stability.

Mechanical Assemblies and Equipment

Installation

Before installing chain:

1. Check conveyor for flatness and obstructions.
2. Check sprocket alignment.
3. Pull a short (about three feet) section of chain through the entire conveyor to detect any obstructions or areas of tight clearance. Make sure tab chains have plenty of clearance, especially on the inside of curves.
4. If necessary, remove obstructions and provide proper chain clearance.
5. Install the chain.

CAUTION

Install chain in 10 foot sections, making all connections on the conveyor frame. Make sure that all connection pins are flush. Thread chain onto conveyor carefully to avoid twisting and possible damage to the chain. Make sure all chains are facing in the correct direction for travel as indicated on the bottom or side of the chain!

Start up conveyor and inspect for proper operation. Correct any problem areas. Frequent inspection and adjustment is recommended during the run-in period to avoid any problems.

Cleaning

Note: In many applications, rapid build-up of grease, dirt, grit, sand, spilled syrup and beverage can occur. These result in:

1. Soiling and damage to the conveyed product.
2. Increased work demands for the chain and motor.
3. Accelerated sprocket tooth wear.
4. Conveyor pulsation and wear.
5. Excessive chain wear on the flight and in the joint areas.
6. Rapid wear of the wearstrips.

Frequent cleaning of the chain and conveyor frame is advised. Such agents as steam, warm water and soap are commonly used. Many times combined “cleaners/ lubricants” are applied continuously. Strong caustic agents used with metal chains should not be used with plastic chains. Always rinse cleaning agents completely off of chain and conveyor frame. When excessive amounts of syrup or other liquids, broken glass or debris accumulate, cleaning will be required on a regular basis to remove these undesirable materials. It is advisable to have operating personnel keep brushes and cleaning solutions nearby to remove broken glass and excessive spillage.

CAUTION

All cleaners and lubricants must be compatible with chain and conveyor materials!

Inspection

Note: In the course of conveyor operation, periodic inspections of the chains, sprockets and systems are required to detect faults and make repairs before serious damage occurs. The important thing is to set up a regular inspection and maintenance schedule.

Checklist:

1. Look for unusual wear patterns on the chain.
2. Inspect chain for proper slack.
3. Check for excessive gap between flights due to jam-up or overload.
4. Pulsating, jerky chain operation indicates poor lubrication or a conveyor obstruction.
5. Check deadplate and turntable clearance.
6. Examine sprockets for signs of excessive wear.
7. Examine sprockets for signs of dirt build-up in tooth pockets.
8. Check for sprocket guide ring wear and possible chain misalignment.
9. Check the guide clearance and wearstrips for excessive wear.
10. Inspect lubrication system for proper operation.
11. Check the inside of curves and the supporting conveyor frame for excess heat build-up which may indicate an obstruction in the curve or a high friction area.
12. If return support rollers are used, check to ensure rollers are free turning.

Repair and Replacement

Note: Any malfunctions found during an inspection usually stem from one or more of the following conditions.

1. Severe overloads, jam-ups, or wedging of broken glass or crowns.
2. Severe back-flexing of chain on the return carrying ways.
3. Poor lubrication or no lubrication.
4. Interference and obstruction.
5. Worn sprockets.
6. Badly worn or damaged chain.

These causes should be corrected to avoid future problems.

Chain and sprockets should be replaced when:

1. The chain measures approximately 123 inches in 80 flights for all chains.
2. The chain jumps the sprocket.
3. The flights have worn to about one-half of the original thickness.
4. The conveying surface becomes uneven through wear.
5. The thrust surface of sideflexing chains wears away and exposes the rivet or other metal parts, which may cut into wearstrips or other conveyor components.
6. The sprocket teeth develop a hooked profile or the chain tends to "hang up" on the sprocket teeth.

Always replace the sprockets at the same time you replace chain. These suggestions on chain and conveyor care serve as a guide toward maintaining continuous, trouble-free operation. Implementation of a conscientious programmed maintenance schedule will lead to many productive hours of conveyor operation.

PREVENTIVE MAINTENANCE GUIDE

Corrosion Resistance Guide

Chain and Wearstrip Materials ~ Data based on 68° F

S - Satisfactory
M - Marginal
U - Unsatisfactory

Common or Chemical Name	Steel	Nylon and Nylatron	Austenitic Series	Ferritic and Martensitic Series	LF Acetal and Acetal	Chemical Resistant Plastic (P)	Ultra High Molecular Weight Polyethylene (UHMWP)	Polypropylene (HT)	Polyethylene (LT)
Acetic Acid	U	M	M	U	U	S	S	S	S
Acetone	U	S	S	S	S	S	S	S	S
Alcohol	S	S	S	S	S	S	S	S	S
Ammonia	M	S	S	S	U	S	S	S	S
Beer	S	S	S	S	S	S	S	S	S
Beverages - Soft Drinks	S	S	S	S	S	S	S	S	S
Benzene	S	S	S	S	S	S	M	M	M
Brine (pickle)	U	M	M	U	M	S	S	S	S
Carbon Tetrachloride	M	S	M	M	S	S	M	M	M
Chlorine	U	U	U	U	U	S	S	S	S
Citric Acid	U	M	S	M	M	S	S	S	S
Cyclohexane					S		U	U	U
Ethyl Chloride		S	S		S	S	M	M	M
Formaldehyde	S	S	S	S	S	S	S	S	S
Formic Acid	U	U	U	U	U	S	S	S	S
Fruit Juices	U	S	S	M	S	S	S	S	S
Gasoline	S	S	S	S	S	S	M	M	M
Hexane			S	S	S	S	U	S	U
Hydrochloric Acid (up to 2%)	U	U	U	U	U	S	S	S	S
Hydrochloric Acid (up to 37%)	U	U	U	U	U	S	S	M	S
Hydrogen Peroxide	U	U	S	M	U	S	S	S	S
Iodine	U	U	U	U	U	U	M	M	M
Isopropanol (isopropyl alcohol)	S	S	S	S	S	S	S	S	S
Kepodene	S	S	S	S	S	S	M	S	M
Lactic Acid	U	M	S	U	S	S	S	S	S
Methylene Chloride			S		S	U	U	S	U
Milk	S	S	S	S	S	S	S	S	S
Muriatic Acid	U	U	U	U	U	S	S	M	S
Nitric Acid (low concentrations)	U	U	S	M	U	S	S	S	S
Oil (vegetable or mineral)	S	S	S	S	S	S	S	S	S
Paraffin	S	S	S	S	S	S	S	S	S
Phosphoric Acid (up to 10%)	U	U	S	U	U	S	S	S	S
Soap and Water	M	S	S	S	S	S	S	S	S
Sodium Chloride	U	S	M	U	S	S	S	S	S
Sodium Hydroxide (up to 25%)	U	U	S	S	U	U	S	S	S
Sodium Hypochlorite (bleach)	U	U	U	U	U	S	S	S	S
Stearic Acid	U	S	S	S	M	S	S	S	S
Sulphuric Acid (up to 40%)	U	U	U	U	U	S	S	S	S
Toluene (Toluol)	S	S	S	S	M	S	U	S	U
Turpentine		S	S		S	S	U	S	U
Vegetable Juices	M	S	S	S	S	S	S	S	S
Vinegar	U	S	S	U	S	S	S	S	S
Water (fresh)	U	S	S	S	S	S	S	S	S
Whiskey	S	S	S	S	S	S	S	S	S
Wine	S	S	S	S	S	S	S	S	S
Xylene	S	S	S	S	S	S	M	U	M

SECTION: 5 TROUBLESHOOTING

Troubleshooting Checks

The interlock circuit prevents an action occurring until one or more related actions have taken place. The interlock action is controlled by relays or by the programmable controller. The interlock circuits are activated by limit switches or photoelectric cells. An inoperative interlock can disrupt the entire system operation.

Electrical System

Occasionally a malfunction may occur because of broken connecting wires, loose connections, and/or dirty or corroded terminals. Such causes can be detected by visual inspection and continuity checks. It is more likely the fault would be in the motor control panels or due to a defective or malfunctioning component or part.

Motor Control Panel

Plant power is fed into the motor control panel through a disconnect device. Fused power is supplied to the motors, which operate the system. Most motors have additional controls, which tie into the system. Lack of drive on any assembly indicates that the first checks should be made of the electrical controls in the motor control panel.

WARNING

This disconnect must always be shut down and locked out during any maintenance operation!

Photoelectric Cells

Many system operations are activated by the interruption of a light beam emitted by a photoelectric cell. There are three major types of PE's used on our equipment:

1. **Beam Detection** (sender/receiver): The sender (emitter) and receiver (detector) are mounted on opposite sides of an object to be detected. When an object breaks the beam of light, a switch is activated.
2. **Proximity Detection**: The light source and receiver are mounted in a common housing. Detection occurs when an object enters the area and the source beam is deflected from the detected object to the receiver.
3. **Reflex** (retro-reflexive detection): The light source and receiver are mounted in a common housing, with light beam directed at a retro-reflector. Detection occurs when an object breaks the beam of light.

Limit Switches

A limit switch is a mechanically operated switch, activated by a moving object. The switch uses changes in mechanical motion to activate electrical circuits, which then causes a mechanical action such as applying a brake or starting motion. Troubleshooting and corrective action, if required, consists of visual and possible physical checks of movement.

Relays

Relays are electro-mechanical devices with multiple contacts which open and close in response to electrical circuit conditions. The action of one device, such as a sensor switch, can cause the reaction of a related device such as a drive motor. The systems described in this manual uses photoelectric cells, proximity switches and limit switches as sensors to activate the control relays through the programmable controller.

Pneumatic Systems

Several assemblies of the system are pneumatically operated by regulated air supplied through air hoses, valves and assorted fittings. If erratic action or malfunctions occur with these assemblies, check the airlines, valves and fittings for leaks.

Mechanical Assemblies and Equipment

Mechanical malfunctions or trouble are usually caused by misalignment, loosened fastening devices, sheared pins and worn or broken parts. Once the trouble has been located, the corrective action requires adjustment, realignment, tightening of loose fasteners and occasionally replacement of a worn or broken part. Corrective action, applied in time, can prevent major maintenance and parts replacement in the future.

Belt Track

WARNING

Never attempt to track or adjust a belt while it is in motion!

1. Lock out power to the drive belt motor. Follow lockout procedures. Take up slack in belt using take-up adjustment until sufficient tension is applied to prevent slippage of belt on drive pulley.

CAUTION

Make sure that take-up bolts are equally adjusted outward to prevent belt from running off pulley!

CAUTION

DO NOT adjust take-up any tighter than necessary to keep good driving condition on drive pulley!

2. Start motors and observe belt operation for tracking.

Note: If additional belt tracking is necessary, it can be done as described below:

- The first procedure in tracking a belt is to make sure the conveyor is installed level, and that the end terminal pulleys are square to the frame. The tracking procedure should start with the return rollers and then to the drive pulley. A belt will track to the point on the pulley it contacts first or the high-tension

side. If the belt runs to one side at a particular point, the cause will probably be the misalignment or leveling of the conveyor. The belt should first be tracked empty and then rechecked in the full load condition. After adjustment, if the belt has been over-corrected, moving the rollers that were adjusted partially back to the original setting should restore tracking. Avoid adjusting additional rollers to correct an "over adjustment".

A very slight adjustment of snub roller or return rollers will cause belt to change direction.

Run the conveyor long enough to allow the belt to make 5 or 6 revolutions before attempting an adjustment or re-adjustment to track belt.

SECTION: 6 APPENDIX

General Notes for Installation Contractor

1. Conveyor, tie-in equipment locations, and building dimensions, are such that final tie-ins may require some cutting and fitting. Any conveyor modification must be approved by customer or vendor personnel, prior to being made.
2. Unless otherwise noted, gearboxes are shipped filled with oil. The fill of these boxes should be checked prior to running conveyor.
3. Conveyor has been all pre-assembled.
4. Where new conveyor connects into existing units, some field fitting may be necessary.
5. Support legs may require occasional relocation due to building conditions or fitting problems. Erector may have to drill new holes in side frames under these circumstances.
6. All sections should be checked for squareness before installing, due to the possibility of being knocked out of square during transportation.
7. All motor and drive chain alignments, and tensions, should be checked by installer.
8. Wear strip alignments, at all joints, should be checked for proper fit.
9. All guide rail settings and alignments should be checked.

Erector Work to Include

1. Unloading at job site and transportation to installation area.
2. Checking the location of all related process equipment verifies that it is in proper location as shown on the conveyor drawings. If discrepancies are discovered, these should be brought to the attention of the customer engineer.
3. Leveling the conveyor: The level of the conveyor should be checked using a 4-foot bubble type level. The conveyor level should be checked in the direction of chain travel as well as perpendicular to it.
4. Chalk lines or other markings should be used during assembly to assure that the conveyor is straight.
5. The support legs should be checked to assure that they are perpendicular to the conveyor.
6. After assembly and rough leveling, the level and straightness of the conveyor should be checked using a transit. Any deviation should be corrected.
7. Some modifications and field fitting may be necessary due to the dimensions of the building or dimensions and locations of equipment being tied in. These modifications should be approved by the customer and vendor engineers.
8. Electrical wiring and tie-ins can now be made.
9. The conveyor should be inspected by the customer, if applicable. The alignment and levels of the conveyor should be checked.
10. The hold-down pads should be positioned and anchored.
11. Install the proper chain as shown on drawings.
12. The chain has to be run in and honed for a period of 12 to 48 hours.

The systems operating test is to be conducted in conjunction with on-line production equipment at the request and direction of the customer. Performance of the conveyor system will be monitored and refinement adjustments made, and the system put through the operational testing necessary, up to the time the customer accepts the workable system.

Installer should be aware that the equipment, including its parts and components, is designed, manufactured, or acquired by MODULAR CONVEYOR EXPRESS to meet the Buyer's requirements and building conditions, and that each part and component cannot be fitted to its mating equipment by MODULAR CONVEYOR EXPRESS prior to shipment. Therefore, some minor corrections, adjusting, or fitting may be required at the job site, which shall be done by the installer.

NOTE: The installer, in order to comprehend the extent of the work involved to accomplish the assembly of a conveyor, should review the manufacturer's drawings. In the absence of information, he should request additional information from the conveyor manufacturer and review a recent installation of like kind.

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