AIR SUPPORTED BELT CONVEYOR

JETBELT™

ASSEMBLY, OPERATION & MAINTENANCE MANUAL

ORIGINAL INSTRUCTIONS

Read this manual before using product. Failure to follow instructions and safety precautions can result in serious injury, death, or property damage. Keep manual for future reference.

Part Number: 900204 R0

Revised: 20/2/14

This product has been designed and constructed according to general engineering standards[a]. Other local regulations may apply and must be followed by the operator. We strongly recommend that all personnel associated with this equipment be trained in the correct operational and safety procedures required for this product. Periodic reviews of this manual with all employees should be standard practice. For your convenience, we include this sign-off sheet so you can record your periodic reviews.

Date	Employee Signature	Employer Signature

a. Standards include organizations such as the American Society of Agricultural and Biological Engineers, American National Standards Institute, Canadian Standards Association, International Organization for Standardization, EN Standards, and/or others.

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1. Introduction

Tramco, Inc. JETBELT™ Air-Supported Belt Conveyor (JETBELT™ conveyor) is an air-supported belt conveyor designed to convey free flowing dry products (such as grain, coal, limestone and aggregates) in all types of industries, especially in applications where dust containment is crucial. JETBELT™ conveyors are tough, dependable, and provide efficient handling capacity with minimum product degradation and substantially reduced product-to-product contamination that you find with other designs. Product features include:

- Rugged, heavy-duty steel construction for durability in the most demanding applications.
- Dust and weather-tight construction to maintain product quality against the elements and prevent dust from escaping.
- Engineered heavy-duty external bearing design for easy maintenance.
- Belt alignment switch with automatic shutoff.
- Head and tail are equipped with removable covers to facilitate maintenance.

Before using the JETBELT™ conveyor, give this manual to the people who will be assembling, operating and maintaining this equipment. Reading and understanding the manual will reduce downtime and equipment failure, as well as help to ensure safe and efficient operation. A sign-off form is provided on the inside front cover for your convenience.

The serial number plates are located on the head assembly and on the tail assembly. Please mark the number in the space provided for easy reference.

Model #	
Serial #	
Production Year	

2. Safety

2.1. GENERAL SAFETY INFORMATION

The Safety Alert symbol identifies important safety messages on the product and in the manual. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety messages.

Why is SAFETY important?

- Accidents disable and kill.
- Accidents cost.
- Accidents can be avoided.

SIGNAL WORDS: Note the use of the signal words **DANGER**, **WARNING**, **CAUTION**, and **NOTICE** with the safety messages. The appropriate signal word for each message has been selected using the definitions below as a guideline.

DANGER	
	Indicates an imminently hazardous situation that, if not avoided, will result in serious injury or death.

WARNING	
	Indicates a hazardous situation that, if not avoided, could result in serious injury or death.

CAUTION	
	Indicates a hazardous situation that, if not avoided, may result in minor or moderate injury.

NOTICE
Indicates a potentially hazardous situation that, if not avoided, may result in property damage.

YOU are responsible for the **SAFE** use and maintenance of your equipment. **YOU** must ensure that you and anyone else who is going to work around the equipment understands all procedures and related **SAFETY** information contained in this manual.

Remember, **YOU** are the key to safety. Good safety practices not only protect you, but also the people around you. Make these practices a working part of your safety program.

Important: *Below are general instructions that apply to all safety practices. Any instructions specific to a certain safety practice (e.g., Operational Safety), can be found in the appropriate section. Always read the complete instructional sections and not just these safety summaries before doing anything with the equipment.*

- It is the equipment owner, operator, and maintenance personnel's responsibility to read and understand **ALL** safety instructions, safety decals, and manuals and follow them when assembling, operating, or maintaining the equipment. All accidents can be avoided.
- Equipment owners must give instructions and review the information initially and annually with all personnel before allowing them to operate this product. Untrained users/operators expose themselves and bystanders to possible serious injury or death.
- Use this equipment for its intended purposes only.
- Do not modify the equipment in any way without written permission from the manufacturer. Unauthorized modification may impair the function and/or safety, and could affect the life of the equipment. Any unauthorized modification of the equipment voids the warranty.
- Do not allow any unauthorized person in the work area.

2.2. ASSEMBLY SAFETY

- Have a minimum of 2 people handle the heavy, bulky components.
- Check all equipment for damage immediately upon arrival. Do not attempt to install a damaged item.
- If the equipment must have an open housing as a condition of its use and application, it must be guarded by a railing or fence.
- Use **rugged gratings** where necessary. If the distance between the grating and moving elements is less than 4”, the grating opening must not exceed 1/2” x 1” (or 1/2” x 2” for hopper gratings). Covers, guards, and gratings at inlet points must be installed so that personnel cannot be injured in any way.
  - Use solid covers that are designed and installed so that personnel are not exposed to accidental contact with any of the equipment’s moving parts.
  - Connect inlet and discharge openings to other equipment in order to completely enclose the equipment.
- As required by the applicable laws, standards, and good practice, the purchaser/ owner is responsible for:
  - guarding all rotating equipment such as drives, gears, shafts, and couplings
  - purchasing and providing safety devices and controls

- Before power is connected to the drive, perform a pre-start-up safety check to ensure the equipment and area is safe and that all guards are in place and secure.
- Electrical equipment must conform to the National Electric Code or National Electrical Safety Code, including requirements for the environment. Also consider:
  - ***Overflow devices*** (electrical interlocks) to warn personnel and shut off power when discharge from conveyor is interrupted.
  - ***Overload protection*** for devices (shear pins, torque limiters, etc.) and ***no speed protection*** (zero-speed switches) to shut off power in the event of an incident that might cause the conveyor to stop operating.
  - ***Safety shut-off switch*** with power lockout provisions at conveyor drive.
  - ***Emergency stop switches*** that are readily accessible.
  - ***Electrical interlocking*** to shut down feeding conveyors whenever a receiving conveyor stops.
  - ***Signal devices*** to warn personnel of imminent start up of conveyor, especially if started from a remote location.

2.3. OPERATIONAL & MAINTENANCE SAFETY

Operational safety means using common sense and knowing and observing the proper precautions.

- Have another person nearby who can shut down equipment in case of accident. It is good practice to always work with a second person.
- Do not operate equipment with any guard removed.
- Keep body, hair, and clothing away from all moving parts.
- Do not modify equipment in any way. Unauthorized modification may impair function and/or safety, and could affect the life of the equipment.
- Advise all operating personnel of the location and operation of all emergency controls and devices. Maintain clear access to these controls and devices.
- Never walk on equipment covers, gratings, or guards.
- Do not use equipment for any purpose other than that which it was intended.
- Do not poke or prod material into the equipment with a bar or stick inserted through the openings.
- The equipment are not normally manufactured or designed to handle materials that are hazardous to personnel (explosive, flammable, toxic, or otherwise dangerous materials). However, equipment may be designed to handle these materials.
- The equipment are not manufactured to comply with local, state, or federal codes for unfired pressure vessels. For example: If hazardous material is to be moved or if the equipment is to be subjected to internal or external pressure, consult Tramco, Inc. prior to any modifications.
- Be aware of hazardous locations where, without protection, people may be injured by contact with equipment or material. If equipment blocks a walkway, provide a crossover stairway or ramp for passage of personnel. If installed overhead, minimum clearance should be 7” for safety.

- Handling foods subjects equipment to special codes for construction, location, and accessibility. Investigate before ordering standard components!
- Food equipment often require hinged access doors for cleaning, and such doors require special safety controls and procedures by customer to prevent personal injuries. For example: The extensive use of padlocks, with keys in the hands of only management personnel, is one means frequently used.

When performing maintenance, understand and observe the following precautions:

- Do not replace or substitute bolts, nuts, or other hardware that is of lesser quality than the hardware supplied. Consult your dealer for proper replacements.
- Perform frequent inspections of the controls, safety devices, covers, guards, and equipment to ensure proper working order and correct positioning.
- After maintenance is completed, replace and secure all safety guards, safety devices, service doors, and cleanout covers.
- Do not climb ladder if damaged, wet, icy, greasy, or slippery.
- Maintain good balance by having at least two feet and one hand or two hands and one foot on ladder at all times.
- Use required safety harnesses and climbing equipment. Consult local safety authorities.
- Perform maintenance during normal daylight hours or in adequate ambient lighting.

The Conveyor Equipment Manufacturer's Association (CEMA) has produced an audio/ visual presentation entitled "Safe Operation of Screw Conveyors, Drag Conveyors, and Bucket Elevators." Tramco, Inc. encourages acquisition and use of this source of safety information.

2.4. ELECTRIC MOTOR SAFETY

- To prevent serious injury or death, only qualified personnel should service electrical components.
- Keep electrical components in good repair.
- Ground electric motor before using.
- Inspect drive belts before using. Replace if frayed or damaged.

2.4.1. LOCKOUT AND TAGOUT PROCEDURES

To minimize possibility of serious injury or death to workers from hazardous energy release (for example, when restarting the equipment) and prevent worker deaths from all forms of hazardous energy release, follow all lockout and tagout procedures when installing and servicing equipment. Ensure that lockout and tagout procedures are adhered to. For example:

- De-energize, block, and dissipate all sources of hazardous energy.
- Lock out and/or tag out all forms of hazardous energy.
- Ensure that only 1 key exists for each assigned lock, and that you are the only one that holds that key.

- After verifying all energy sources are de-energized, service or installation may be performed.
- Ensure that all personnel are clear before turning on power to equipment.

For more information on occupational safety practices, contact your local health and safety organization.

2.5. SAFETY DECALS

- Keep safety decals clean and legible at all times.
- Replace safety decals that are missing or have become illegible. See decal location figures that follow.
- Replaced parts must display the same decal(s) as the original part.
- Replacement safety decals are available **free of charge** your distributor, dealer, or factory.

2.5.1. DECAL INSTALLATION/REPLACEMENT

1. Decal area must be clean and dry, with a temperature above 50°F (10°C).
2. Decide on the exact position before you remove the backing paper.
3. Align the decal over the specified area and carefully press the small portion with the exposed sticky backing in place.
4. Slowly peel back the remaining paper and carefully smooth the remaining portion of the decal in place.
5. Small air pockets can be pierced with a pin and smoothed out using the sign backing paper.

2.5.2. SAFETY DECAL LOCATIONS AND MESSAGES

Replicas of the safety decals that are attached to the equipment and their messages are shown in the figure(s) that follow. Proper safety procedures require that you familiarize yourself with the various safety decals and the areas or particular functions that the decals apply to, as well as the safety precautions that must be taken to avoid serious injury, death, or damage.

- Place decals 1, 2, 3, & 4 near the conveyor discharge.
- Place decal 5 & 6 near the inlets.
- Place decal 7 on and behind the belt or chain guard.
- Place decal 8 on the head and tail sections. Additional placements of decal 8 may be used and their locations are up to the site supervisor.
- Place decal 9 on the motor conduit boxes.
- Place decal 10 on all head, tail, and intermediate section covers, as well as all inspection and access opening covers.

DECAL #1: ANSI-CSD-N-001-ES

NOTICE

To prevent damage to the equipment:

- Check bearings weekly for proper operation.
- Lubricate bearings every six months, or after heavy usage, every three months.

See manual for more bearing information and lubrication schedule.

Made in USA ANSI-CSD-N-001-ES

NOTICE

For proper operation and to prevent damage to the equipment:

- Check splice protector / wiper cleat for wear and replace if worn.
- Working splice protectors / wiper cleats:
  - prevent product buildup on return pan.
  - ensure proper reloading of product.
  - prevent wearing of the belt splice.

See manual for more information.

Made in USA ANSI-CSD-N-002-ES

DECAL #2: ANSI-CSD-N-002-ES

IMPORTANT

Material must flow evenly down the back slope of the inlet near the speed of the belt for proper loading. This is required for successful loading and operation of the conveyor. See installation manual for further details.

Material Flow →

Made in USA ANSI-CSD-MF-001-ES

DECAL #5: ANSI-CSD-MF-001-ES

NOTICE

To prevent damage to the gear reducer, ensure oil is filled to level specified by manufacturer in manual.

Made in USA ANSI-CSD-N-003-ES

DECAL #3: ANSI-CSD-N-003-ES

NOTICE

For proper operation and to prevent product damage:

- Check conveyor belt tension and tracking weekly or more often during seasonal weather changes.
- Check drive belt tension and tracking weekly.
- Conveyor covers must be clamped in place to minimize dust and weather contamination.

Made in USA ANSI-CSD-N-004-ES

DECAL #4: ANSI-CSD-N-004-ES

IMPORTANT

Material must flow evenly down the back slope of the inlet near the speed of the belt for proper loading. This is required for successful loading and operation of the conveyor. See installation manual for further details.

Material Flow ←

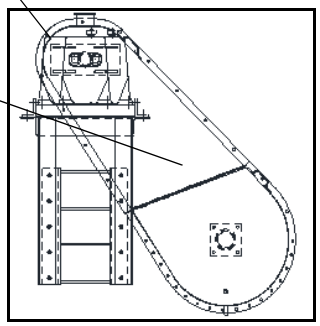
Made in USA ANSI-CSD-MF-002-ES

DECAL #6: ANSI-CSD-MF-002-ES

DECAL #9: ISO-CSD-005

DECAL #8: ISO-CSD-004

DECAL #7: ISO-CSD-003



DECAL #10: ISO-CSD-008

DECAL#1: ISO-CSD-004

DECAL#2: ISO-CSD-003

DECAL#3: ISO-CSD-008

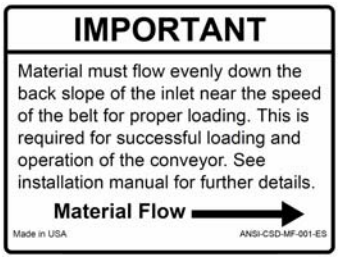
DECAL#4: ISO-CSD-005

DECAL #1: ANSI-CSD-N-001-ES

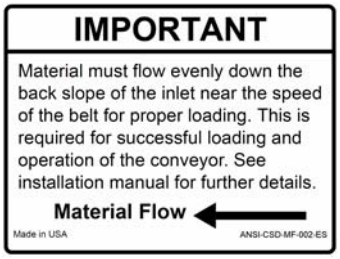
DECAL #2: ANSI-CSD-N-002-ES

DECAL #3: ANSI-CSD-N-003-ES

DECAL #4: ANSI-CSD-N-004-ES



DECAL #5: ANSI-CSD-MF-001-ES



DECAL #6: ANSI-CSD-MF-002-ES

3. Assembly

WARNING *Before continuing, ensure you have read and understand the relevant information in the safety section. Safety information is provided to help prevent serious injury, death, or property damage.*

3.1. PRE-ASSEMBLY

Important: *A qualified contractor or millwright must be used to erect the conveyor and the accompanying equipment and structures.*

3.1.1. SHIPPING CHECK

1. Check if all items in the shipment have been received and inspect the casing sections, covers, buckets, chain guards, and drives for dent; and check all bolts including the bearing bolts, conveyor bolts, support leg bolts, etc. as they may have loosened during shipping.
2. Check if all loose assemblies listed on the Bill of Materials (such as limit switches/sensors, support legs, caulking, hardware, mating flanges, inlet & inspection doors and drive components, etc.) have been received.
3. Mark claims for damaged parts on the shipping papers and immediately file a claim. **Do not attempt to install a damaged item**.

Note: *Due to their length, the normal shipping practice will have the head and intermediate sections of the JETBELT™ conveyors being shipped separate from one another. See Section 3.7. for additional information. The tail section is typically shipped with the take-up assembly. The belt will be wrapped in plastic, coiled and then stacked on pallets.*

3.2. LIFTING AND MOVING

Take extreme care 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 feet.

WARNING	
	Never lift a conveyor with only one support point. When choosing supports points for especially heavy items such as drives or gates, consider the weight of an item in relation to load balance and its bending effect.

3.3. JETBELT™ COMPONENTS

JETBELT™ conveyor requires less horsepower and no idlers in either the material carrying or empty return pan, regardless of conveying distance. The head section is split, making removal of shaft and pulley assemblies easy. The tail section has bolt-on covers and a slot for pulley removal.

Figure 3.1

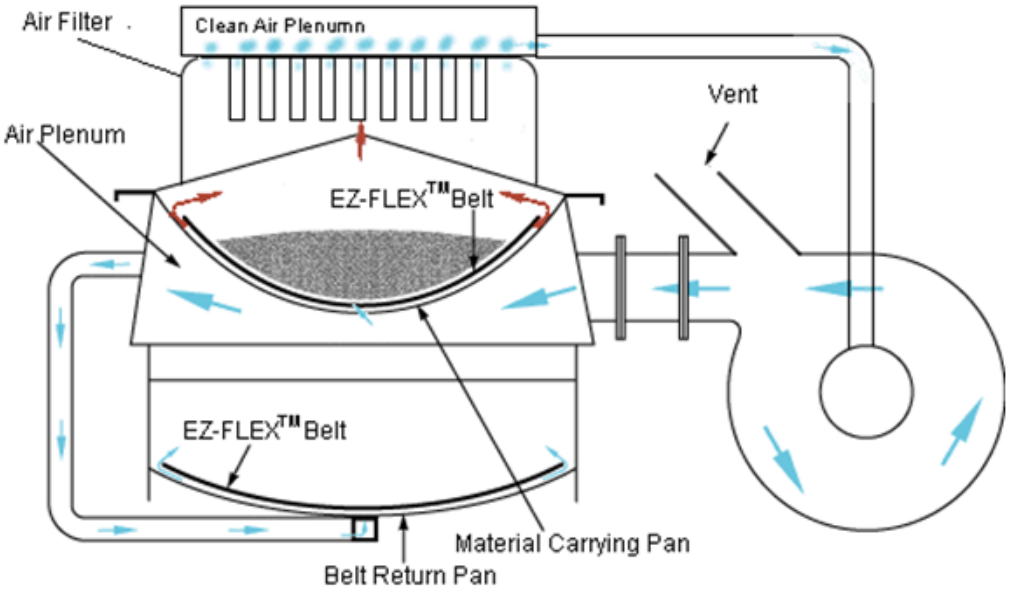
Typical JETBELT™ conveyor consists of the following components:

- Head discharge section with drive shaft
- Tail section with take-up assembly
- Intermediate trough section
- Rino seals
- EZ-Flex belt
- Assembly bolts & alignment pins

Graphical representations of the components of the JETBELT™ conveyor can be found in sections 3.3.1. – 3.3.7.

Note: *The graphical representations of the components of the JETBELT™ conveyor are **representative drawings only**. It is the responsibility of the purchaser to consult contract drawings for specific items on each conveyor.*

3.3.1. JETBELT™ OVERVIEW



CROSS-SECTION OF JETBELT™

Figure 3.2

The load-carrying EZ-FLEX Belt is supported by a layer of air between the belt and the pan. The air is supplied from a fan, which pressurizes the air chamber under the pan. The air flows up through holes in the pan. The air is then vented to a dust control system. This unique design allows the JETBELT™ to free span 40 feet or greater. TRAMCO exclusively uses the EZ-FLEX belt for its JETBELT™ conveyors. The EZ-FLEX belt combines unique qualities such as more lateral elasticity in cold climates and the ability to readily conform to the air film between the belt and the conveyor plenum, without compromising longitudinal strength.

3.3.2. HEAD DISCHARGE SECTION WITH DRIVE SHAFT

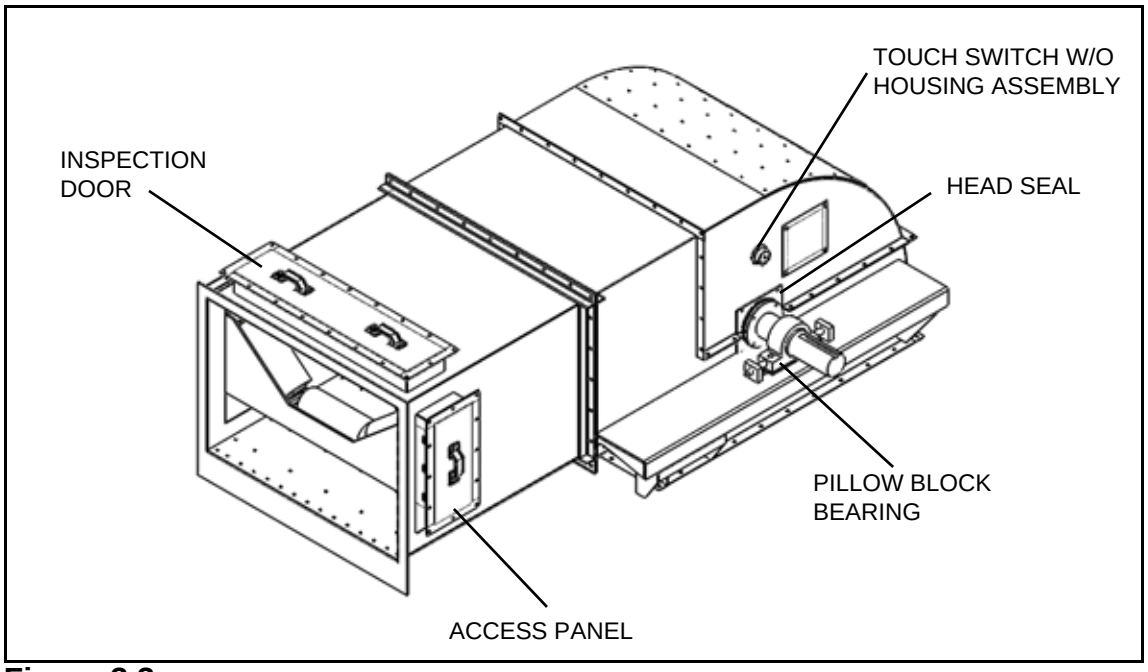


Figure 3.3

Note: *The head discharge section with drive shaft is shown without the typical drive assembly. The illustration below shows the side view of a typical drive assembly with the support structure that would be attached to the conveyor.*

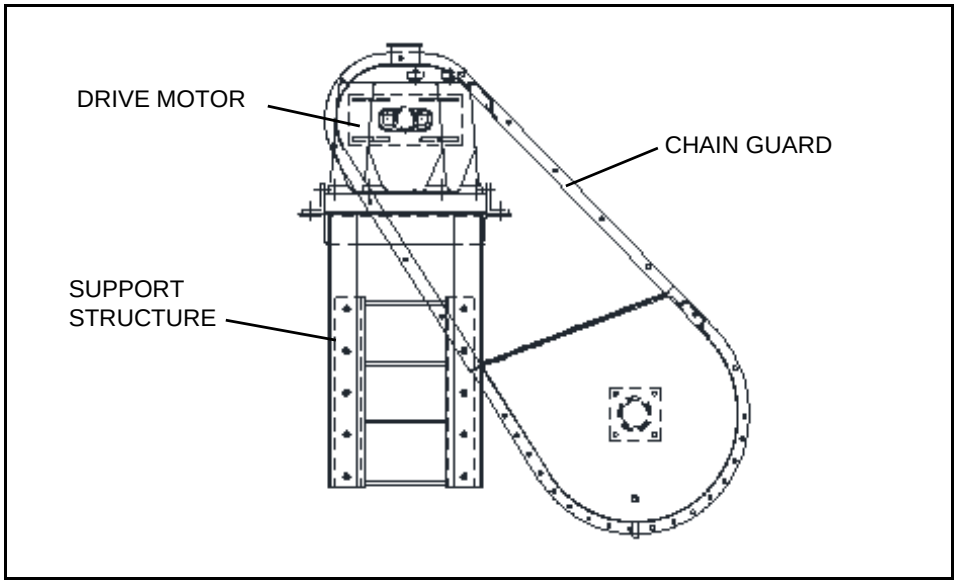


Figure 3.4

3.3.3. TAIL SECTION WITH MANUAL TAKE-UP ASSEMBLY

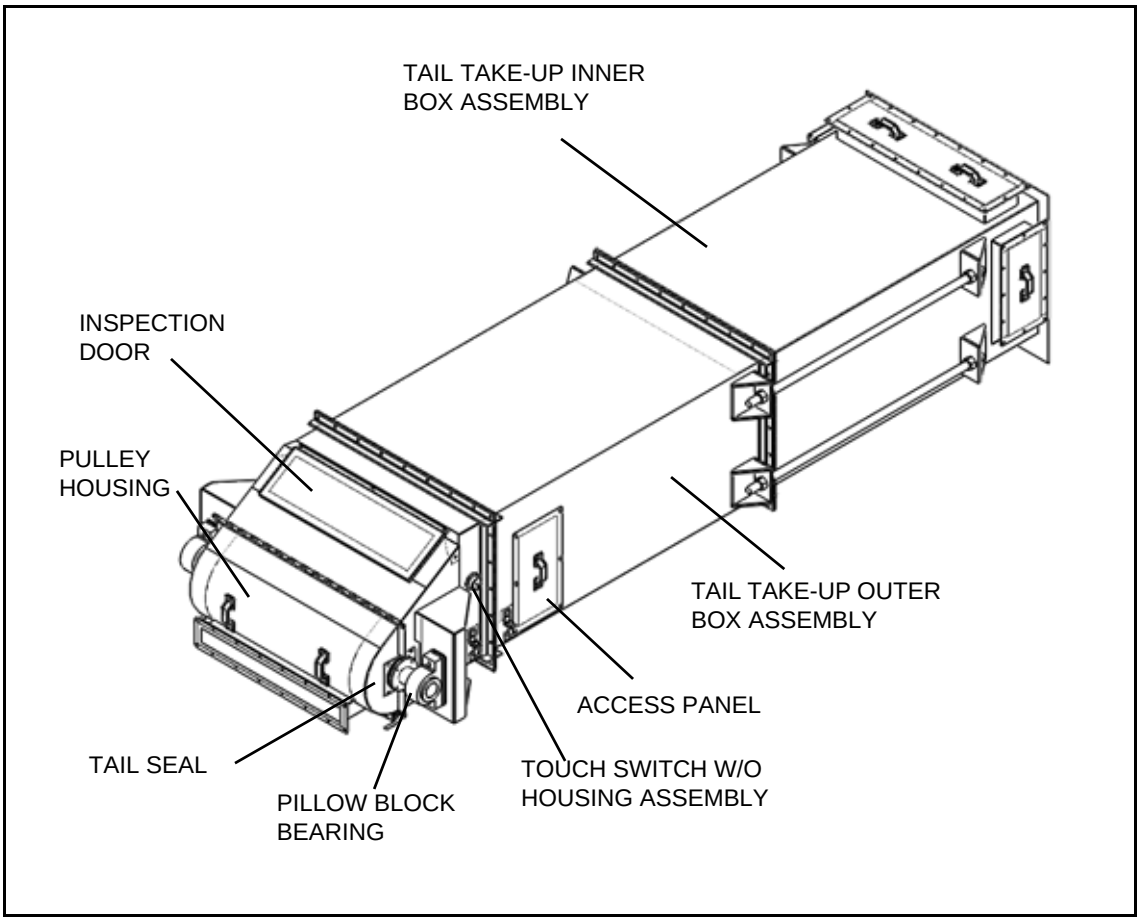
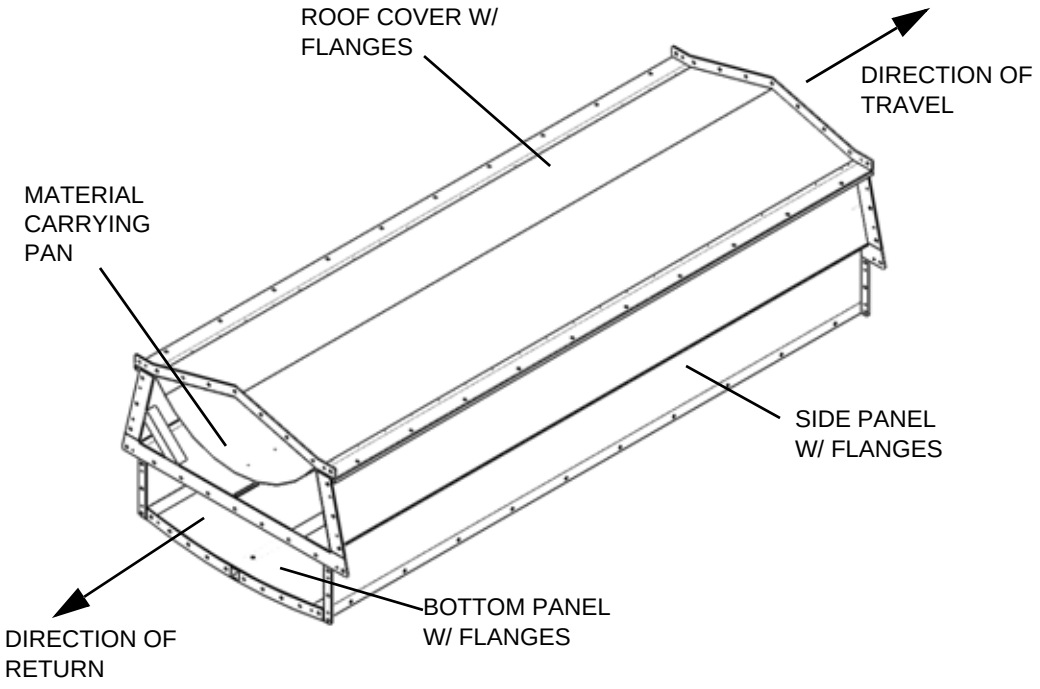
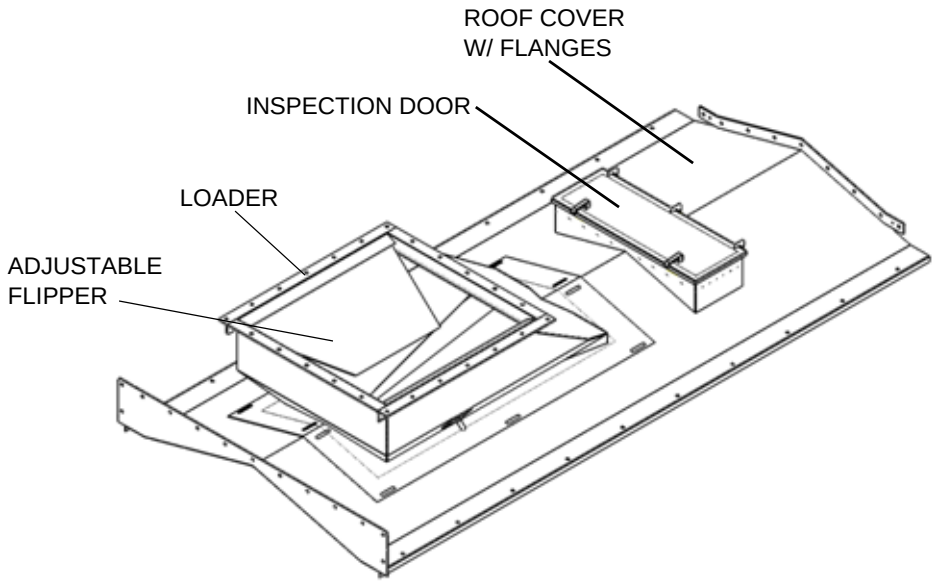


Figure 3.5

3.3.4. INTERMEDIATE TROUGH SECTION

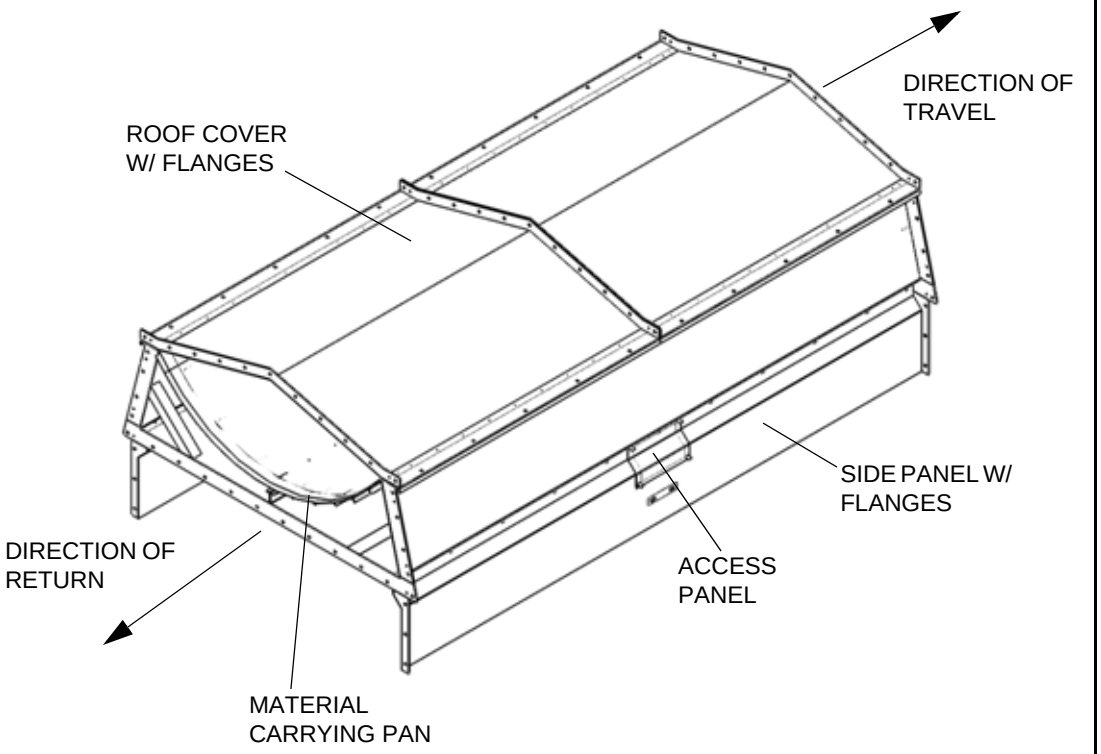


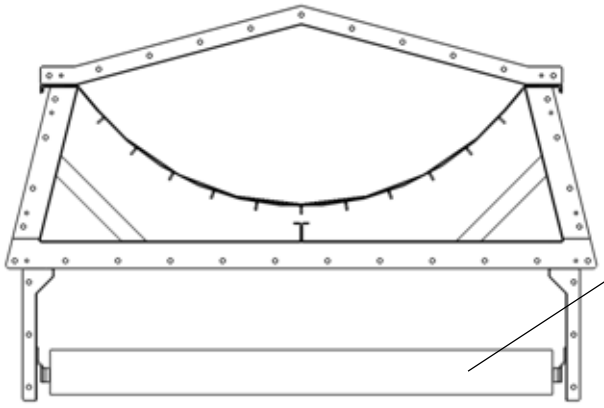
A. INTERMEDIATE SECTION WITH AIR RETURN
(SHOWN WITH TYPICAL ROOF COVER)



B. TYPICAL ROOF COVER SHOWN WITH LOADER AND INSPECTION DOOR

Figure 3.6





INTERMEDIATE SECTION WITH ROLLER RETURN
(SHOWN WITH TYPICAL ROOF COVER)

Figure 3.7

3.3.5. V-PLOW ASSEMBLY

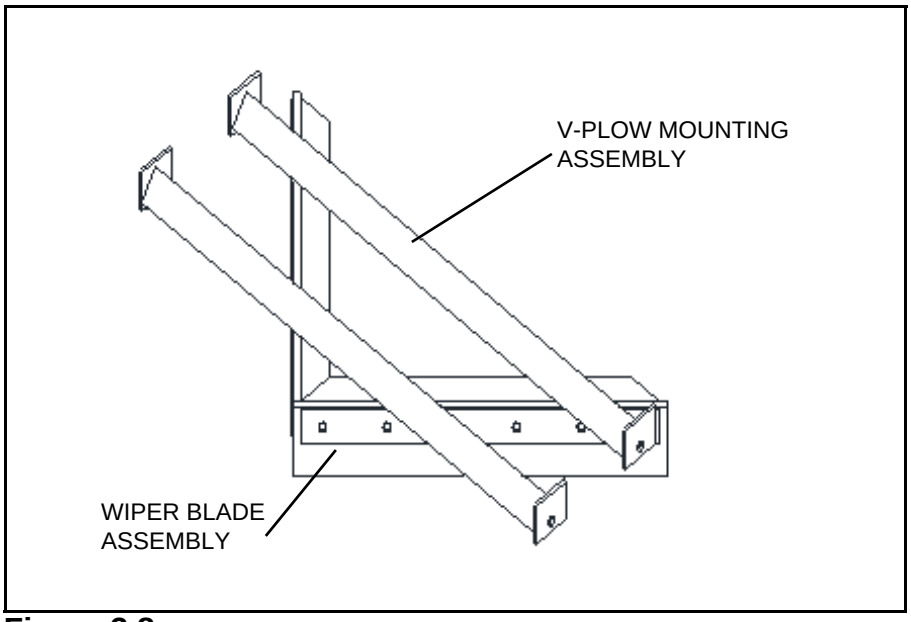


Figure 3.8

3.3.6. TOUCH SWITCH ASSEMBLY

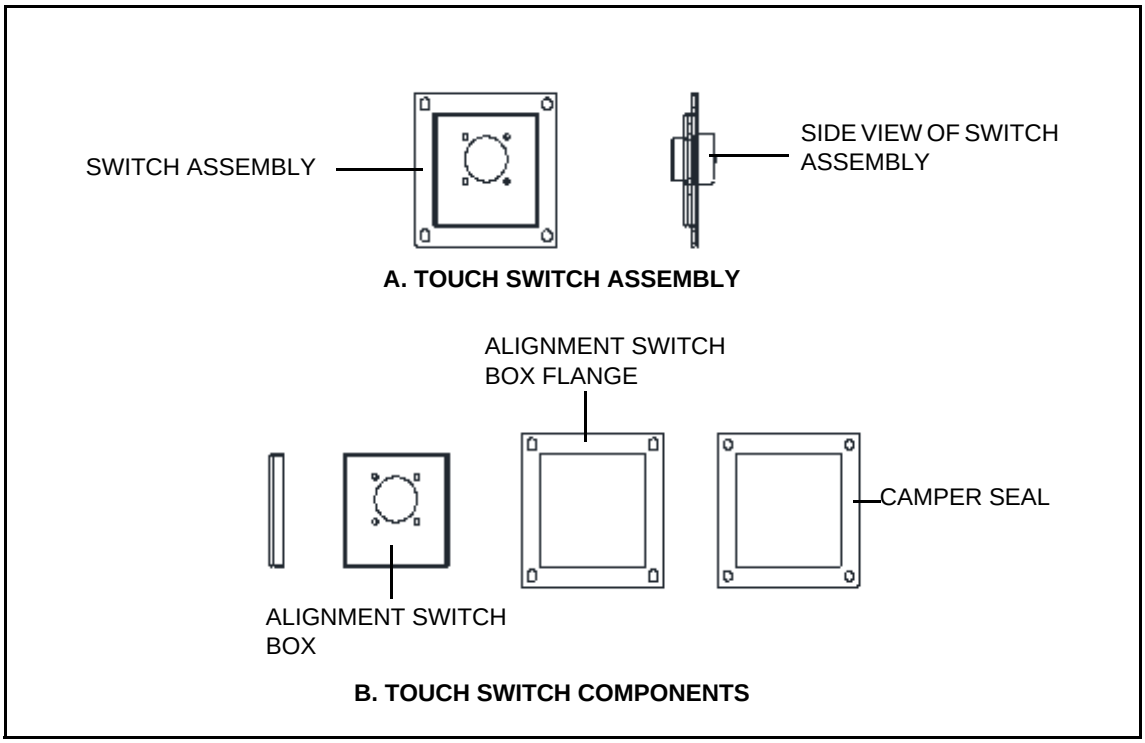


Figure 3.9

3.3.7. RINO SEALS

HEAD RINO SEAL

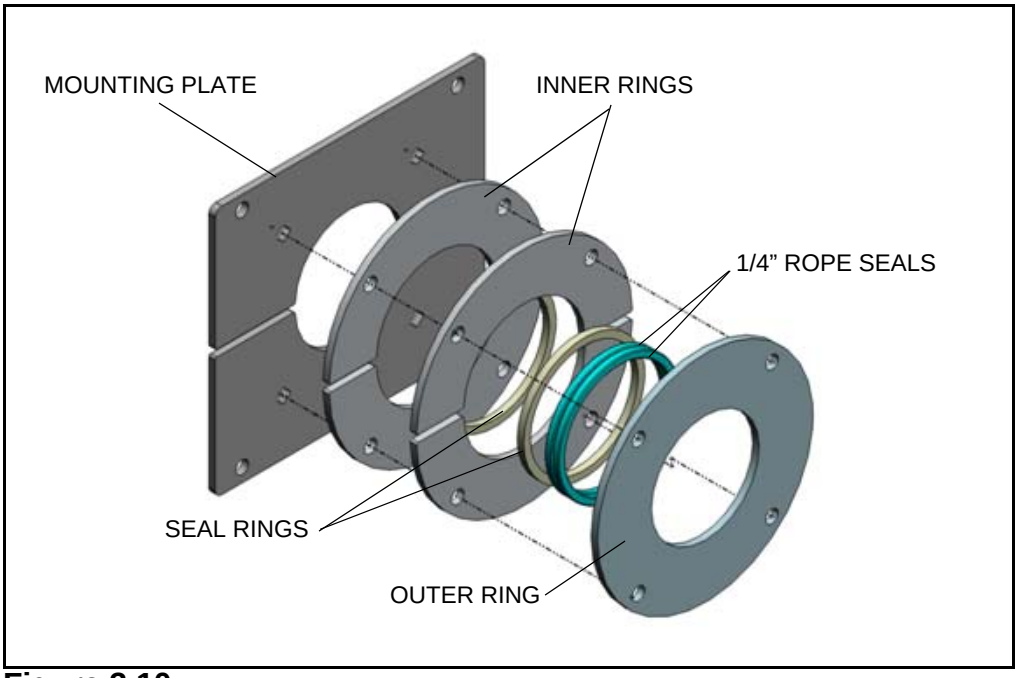


Figure 3.10

TAIL RINO SEAL

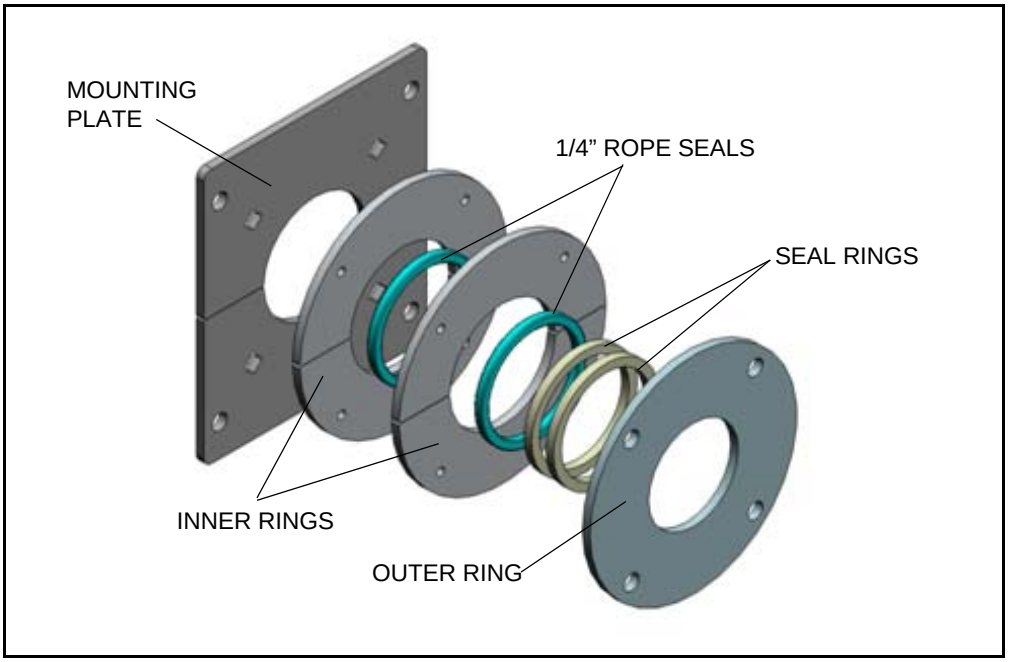
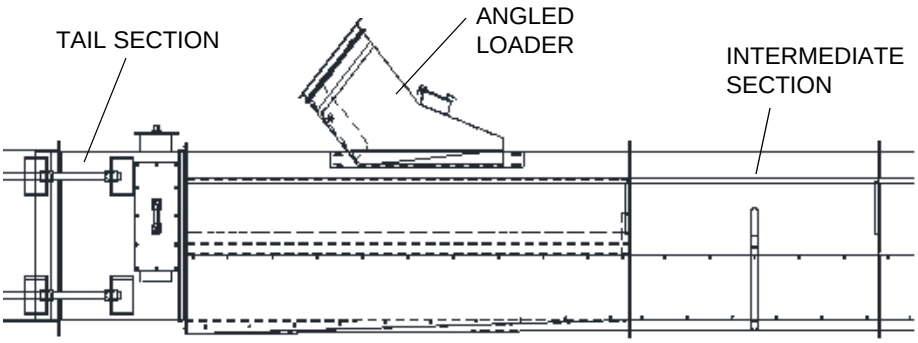


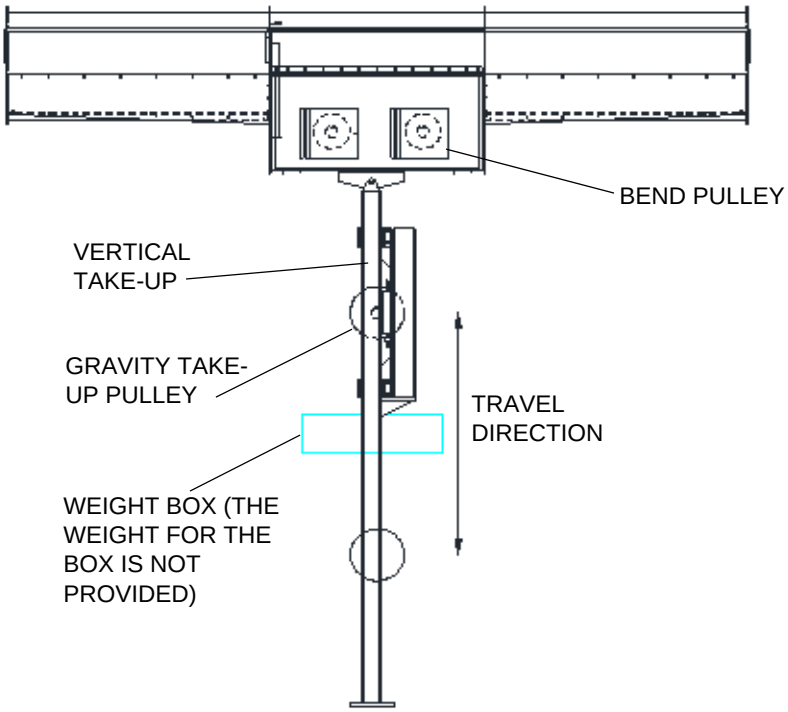
Figure 3.11

3.4. GENERAL ARRANGEMENT DRAWINGS



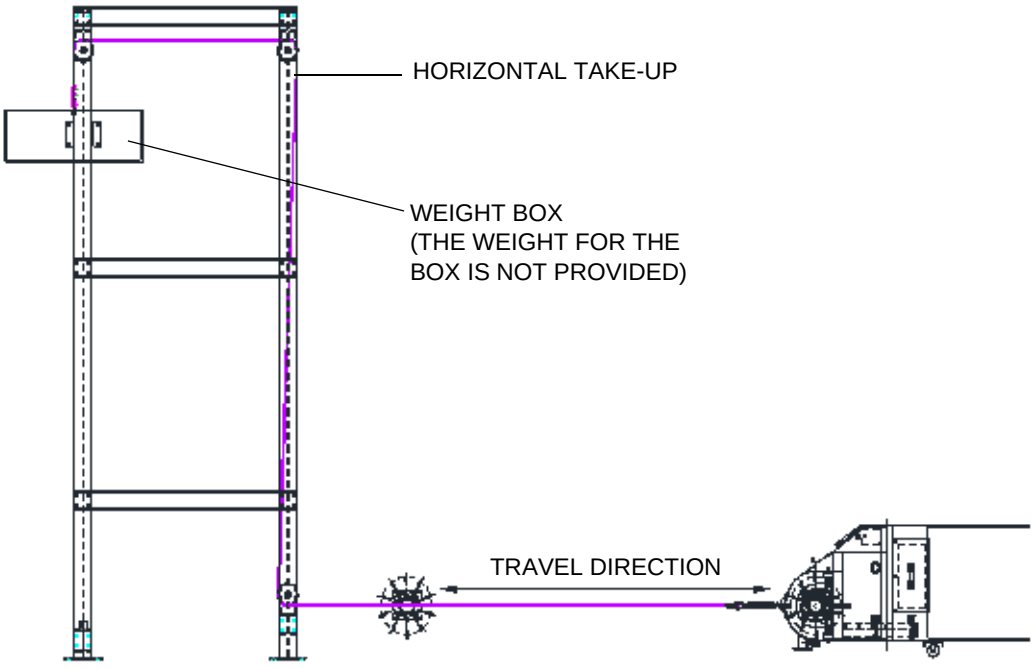
INTERMEDIATE SECTION ATTACHED TO HEAD SECTION
(SHOWN WITH AN ANGLED LOADER)

Figure 3.12



VERTICAL GRAVITY TAKE-UP
(SHOWN BETWEEN TWO INTERMEDIATE SECTIONS)

Figure 3.13



HORIZONTAL GRAVITY TAKE-UP
(SHOWN BETWEEN ATTACHED TO HEAD SECTION)

Figure 3.14

Note: *The safety rail needs to enclose the take-up and the total "travel direction" area. A **safety rail** is not provided.*

3.5. GENERAL ASSEMBLY INSTRUCTIONS

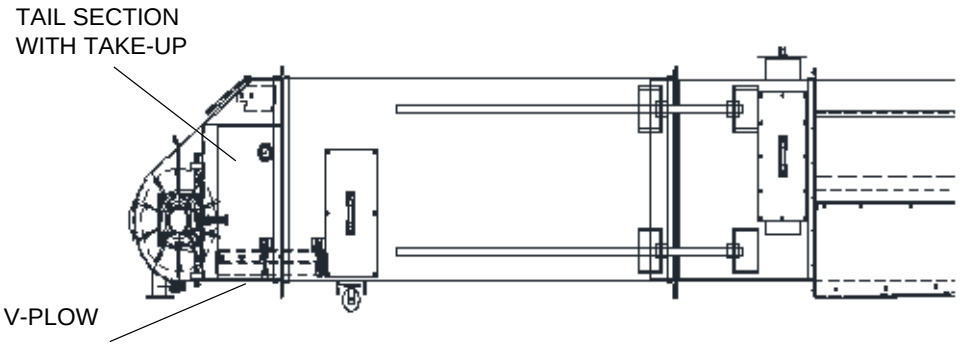
Important: *All component pieces (or conveyor sections) should be placed in proper sequence as illustrated in the drawing provided before starting the assembly.*

WARNING

To minimize risk of serious injury, death or property damage, follow the safety instructions in this manual concerning assembly.

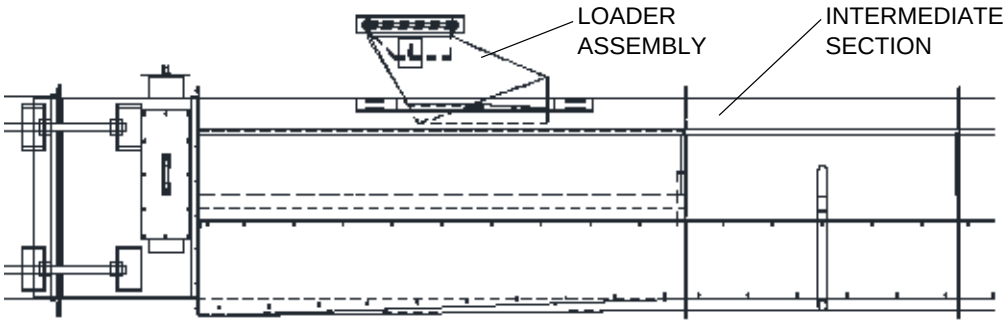
NOTICE

Other support structures must be provided for other equipment (such as distributors, cleaners, spouting, etc.) since the JETBELT™ conveyor will not support such equipment.



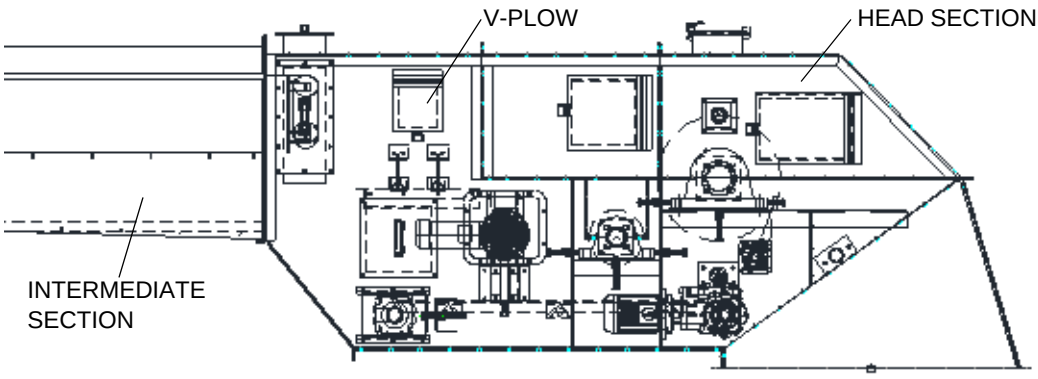
JETBELT™ TAIL SECTION
(SHOWN WITH TYPICAL SCREW TAKE-UP)

Figure 3.15



JETBELT™ INTERMEDIATE SECTION
(SHOWN WITH TYPICAL INLET LOADER)

Figure 3.16



JETBELT™ HEAD SECTION
(SHOWN WITH TYPICAL INSPECTION & ACCESS DOOR)

Figure 3.17

NOTICE

For safety and proper operation, enclosed belt conveyors must be assembled and erected straight and true. The purchaser is responsible for ensuring all support and mounting surfaces are straight and level so there is no distortion in the conveyor.

3.5.1. SECTION ASSEMBLY

FOR SHOP-ASSEMBLED CONVEYORS

1. Units are match marked and shipped in the longest sections practical for shipment. Field assembly can be accomplished by connecting marked joints in accordance with the packing list and/or drawing, if applicable.
2. Ensure the mounting surfaces for supporting the conveyor is level and true so there is no distortion in the conveyor.
3. Shims or grout should be used when required. Frequently check for straightness during assembly.

FOR CONVEYOR ASSEMBLIES PURCHASED AS PARTS/MERCHANDISE

1. Use the trough assembly match marks to place the conveyor troughs in proper sequence with the tail section, the bypass inlet (if applicable), and the head section in their proper locations. Connect the trough flanges loosely (See “Typical Flange Connection” on page 29.). Do not tighten bolts.
2. Align the trough bottom centerlines perfectly using the alignment pins; apply appropriate sealant (caulking, silicon, Gortex, or neoprene); then tighten flange bolts to manufacturer’s torque specifications.
3. Tighten all anchor bolts to manufacturer’s torque specifications.
4. Before connecting the belt, loosen take-up as much as possible. Check belt alignment. Check set screws and bearing bolts for tightness.
5. Connect top section for the belt. Refer to Section 3.5.5. for belt installation.

Note: *On long conveyors, the use of a come-a-long may be necessary.*

- Adjust take-up to remove excess slack from belt making sure that adjustment screws have been tightened equally to prevent misalignment.
- Install trough covers in the proper sequence. Handle covers with reasonable care to avoid warping or bending. Covers should be securely fastened.
- Install drive at the proper location and in accordance with separate instructions provided.
- Rotate conveyor manually to ensure that no binding occurs.

Note: *Re-check the assembly if binding does occur.*

- Check for proper direction of belt travel after electrical connections have been made and before attempting to handle material.

- If necessary, after lockout/tagout, reconnect electrical leads to reverse direction of material flow. Material should be pushed by the flight and attachment.

Note: *All electrical work must be performed by a licensed electrician.*

- Attach all gates, feed chute, discharge chute, etc., and connect all safety devices and controls according to the assembly drawing for your conveyor. **Carefully test to ensure proper operation.**

NOTICE

When lifting conveyor casing, do not allow the casing to drag on the ground.

Flanges and casing sections may be damaged to the extent that assembly and plumbing will be extremely difficult.

Note: *When lifting any assembly of the belt conveyor parts (i.e. the head and casing, or an assembly of casing), the line of the lifting force should be in line with the narrowest part of a casing section.*

3.5.2. 0CONVEYOR FAN INSTALLATION

1. Install the conveyor fan assemblies with filters and connecting duct piping per Tramco general arrangement drawing and manufacturers installation instructions.
2. Install the pressure gage and low differential pressure switch for each plenum fan per manufacturers instructions.
3. Complete all wiring to provide power to plenum fans and interlock switches to shut down conveyor if plenum pressure drops.
4. Check fan operation for proper rotation and drops. Adjust dampers on pressure side of fans to obtain pressure in plenums.
5. Lock dampers in place so they can not be accidentally moved.
6. Check to see all fan systems are working correctly.

3.5.3. TAKE-UP ASSEMBLY

There are different types of gravity take-up options. Installation of two take-up (vertical and horizontal gravity take-up) are described below:

A. VERTICAL GRAVITY TAKE-UP

1. Install the vertical gravity take-up assembly as illustrated in Figure 3.13. Refer to the general arrangement drawing.
2. Check that the pulleys are level and square with the conveyor.
3. Check that the take-up guides are square and true with the conveyor.
4. Install the counterweight box, cables and clamps. Be sure cables are adjusted so the counterweight box pulls evenly on the take-up frame above.
5. Tighten all components securely in place.

B. HORIZONTAL GRAVITY TAKE-UP

1. Install the horizontal gravity take-up assembly as illustrated in Figure 3.14. Refer to the general arrangement drawing.
2. Check that the pulleys are parallel and square with the conveyor.
3. Check that the take-up guides are square and true with the conveyor.
4. Install the counterweight box, cables and clamps. Be sure cables are adjusted so the counterweight box pulls evenly on the take-up frame above.
5. Tighten all components securely in place.

3.5.4. TYPICAL FLANGE CONNECTION

1. Insert the alignment band at the flange connection.

Figure 3.18

2. Center the alignment band along the length of the joint.

Figure 3.19

3. The alignment band has been centered along the length of the joint.

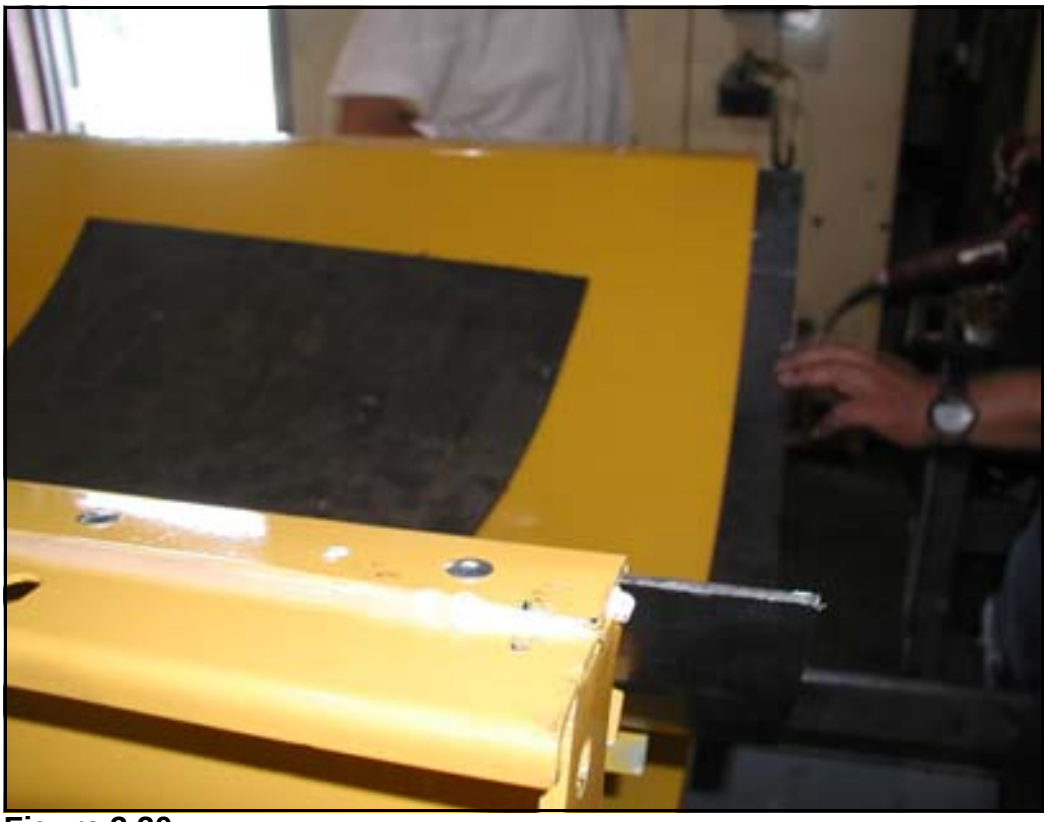


Figure 3.20

4. Apply silicon along the entire length of the joint.

Figure 3.21

5. Apply silicone onto all flange faces in the area shown.

Figure 3.22

6. Connect the beads of silicon as shown.

Figure 3.23

7. Align both sections and insert a connection rod, as shown.

Figure 3.24

8. Make sure the adjoining section slides over the alignment band.

Figure 3.25

9. Start tightening the connecting rods on both side at the same time.

Figure 3.26

10. Shows the sections coming together.

Figure 3.27

11. Completely tighten the connecting rods on both sides.

Figure 3.28

12. Connect the sections together using the flange bolts. Use an aligning rod if necessary. Then remove the connecting rods and replace with the appropriate flange bolt.

Figure 3.29

3.5.5. BELT INSTALLATION

1. Using the take-up adjustment screws, move the tail pulley to its shortest take-up position.

Note: *If either gravity take-up option (vertical or horizontal) is used in place of the typical screw take-up, the main gravity pulley must be in its shortest take-up position during the installation of the belt.*

2. Remove the head cover cap and thread a strong rope or cable down the length of the trough sections until the end can be removed through the tail section opening.
3. Attach a rope or cable to the belt. Fabricate a piece of steel angle to connect the rope to the belt as described in the following steps:
   - Cut the steel angle the same length as the belt width.
   - Drill holes in one side of steel angle to match the attaching holes in the belt.
   - Drill a single hole in the center of the other side of the steel angle for mounting an eyebolt.
4. Install the eyebolt, attach the steel angle to the end of the belt, and attach the rope or cable.
5. Use a rope or cable to pull the belt to the head pulley.

6. Secure the end of the belt in this position and thread the end of the rope or cable down the length of the trough sections.
7. Use the rope or cable to thread the belt over the head pulley, down the length of the trough sections, around the tail pulley and any gravity take-ups in the conveyor system.
8. Joining the ends of the belt: There are many different ways to join the ends of the belt. The best practice is to use the joining method as recommended by the belt manufacturer. Regardless of the joining method used, the use of a “vulcanized” belt splice kit is required. The vulcanized belt splice kit, with the necessary **belt splicing** instructions, can be ordered through Tramco, Inc. or direct from the belt manufacturer.

Important: ***No belt and/or splice kit substitutions are to be made without the express written consent of an authorized representative of Tramco, Inc. management.***

- Prepare the ends of the belt using extreme care to ensure the belt ends are square and true. Failure to ensure the belt ends are square and true will result in the belt not tracking straight. The maximum tracking or wandering variation allowed for a JETBELT™ conveyor is 1-1/2” (+/- 1/2”). If the belt tracking or wandering is greater than this, the splice must be redone. Therefore, the more care used in making a proper splice, the less likely the belt will have a tendency to exceed the maximum tracking variation allowed.

Note: *The importance of square and true belt ends to a successful belt splice must be stressed to the belt vulcanizer. With a properly spliced belt, the belt will perform as intended. A properly spliced belt is important, as the JETBELT™ conveyors are more critical of a crooked splice than conventional belt conveyors.*

- Ensure the belt is properly tensioned after being spliced and/or having splice protectors/ flipper cleats installed.
- Tighten the belt to the proper specifications of the belt manufacturer.

3.5.6. TOUCH SWITCH ASSEMBLY

The belt alignment is monitored with a Touch Switch monitor installed near the top centerline of the head pulley to detect belt and head pulley misalignment. The belt alignment is also monitored with a Touch Switch monitor that is installed on the top carrying belt to detect belt misalignment and tail end.

The Touch Switch monitor will shut off the JETBELT™ conveyor if the belt alignment becomes misaligned. Adjusted properly and regularly monitored, the Touch Switch monitor is designed to prevent premature failure, wear and damage of the belt, pulleys, and the conveyor housings.The belt must be properly installed and tracked before belt alignment Touch Sensor monitors can be installed. Additional safety switches may be added to the JETBELT™ conveyor in accordance with their manufacturer’s installation instructions.

3.5.7. CHECK HEAD SHAFT FOR LEVEL

It is possible that the level condition of shaft could have been altered during shipping and handling. If shaft is not level, install shims under the pillow-block bearing on the low side. The head section must be properly supported so there is no vertical or horizontal movement. The support structure should be attached to the bolted connections of the head section on the bottom or top depending on the design of the motor mount.

NOTICE

If the head shaft is not level, the belt will not “track” properly and could wear a hole in the side of the head, pulleys, and the tail.

3.5.8. ADJUSTING THE V-PLOW

The V-Plow is a bolted on attachment (Figure 3.8) and is NOT set at the factory. Follow the procedure below to adjust the V-Plow.

1. Adjust the V-Plow so that the Neoprene blade is 1/4" to 1/2" above the conveyor belt. There are vertical slots in the Tail take-up outer box assembly to allow for easy adjustment of the V-Plow assembly.
2. As necessary, the V-Plow may have to be set at an angle to follow the belt line as it rises to the tail pulley.

Note: *The V-Plow must be adjusted after the conveyor belt has been installed and properly tensioned.*

3.5.9. SKIRT ASSEMBLY

The skirt assembly prevents side spillage of material and keeps the load centered on the belt. Follow the steps below to make sure the skirt assembly is properly installed.

1. Ensure maximum distance between the skirt board is two-thirds the width of a troughed belt.
2. Adjust the height of the skirt assembly after the tension on the belt is set.
3. Lock the skirt assembly in place at the point where the neoprene wiper is approximately 1/8” above the belt.

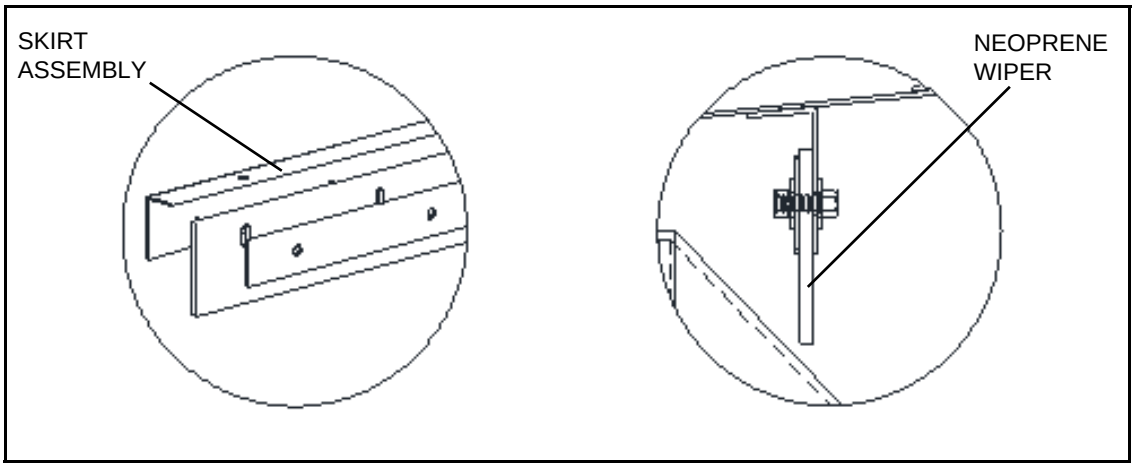


Figure 3.30

4. Check if the material is at rest on the belt before it reaches the end of the skirt. If the material is still tumbling as it passes the skirt end, lengthen the skirt or reduce the inlet speed to match the speed of the belt.

Note: *The skirt assembly is only on the primary loader. All subsequent loaders **do not** have the skirt assembly.*

3.6. COMPONENT INFORMATION

3.6.1. DRIVE

INSTALLATION

Depending on the type and size of the drive, and the customer order, it may be necessary to site fabricate a support/torque absorption point from a suitable structure. Fit the drive per the instructions in the ***drive manufacturer's manual***.

REPLACEMENT

Refer to the ***drive manufacturer's manual***. Consult contract drawings for specific drive details used on the conveyor. Note the weight for lifting purposes. Follow the Lockout/Tagout procedures in this manual.

3.6.2. BEARINGS

INSTALLATION

Install the bearings per the instructions in the ***bearing manufacturer's manual***.

REPLACEMENT

Refer to the ***bearing manufacturer's manual*** for replacement recommendations for bearings operating at low speed. Consult contract drawings for specific bearing details used on the conveyor.

Note: *Tramco, Inc. recommends that bearings (or bushings) and seals be replaced every 2 years, or have vibration and/or temperature monitoring (done by others) carried out to ensure continued safe operation.*

3.6.3. SEALS

INSTALLATION

Refer to Figure 3.10 and 3.11 for the exploded isometric view of the head and tail seals. Install the seals as shown in these figures. Refer to bolt suppliers for **bolt torque specifications**.

REPLACEMENT

The head and tail section seals can be replaced by sliding the inner and outer rings along the shaft, prying out the rope seal, and fitting a new rope seal.

Note: *Tramco, Inc. recommends that bearings (or bushings) and seals be replaced every 2 years, or have vibration and/or temperature monitoring (done by others) carried out to ensure continued safe operation.*

Important: *All manufacturer's manuals, product information, and data sheets will be shipped with each conveyor. It is the responsibility of the contractor, installer, owner, and user to read and follow the manufacturer's installation instructions and maintenance recommendations.*

3.7. SUPPLEMENTAL ILLUSTRATIONS

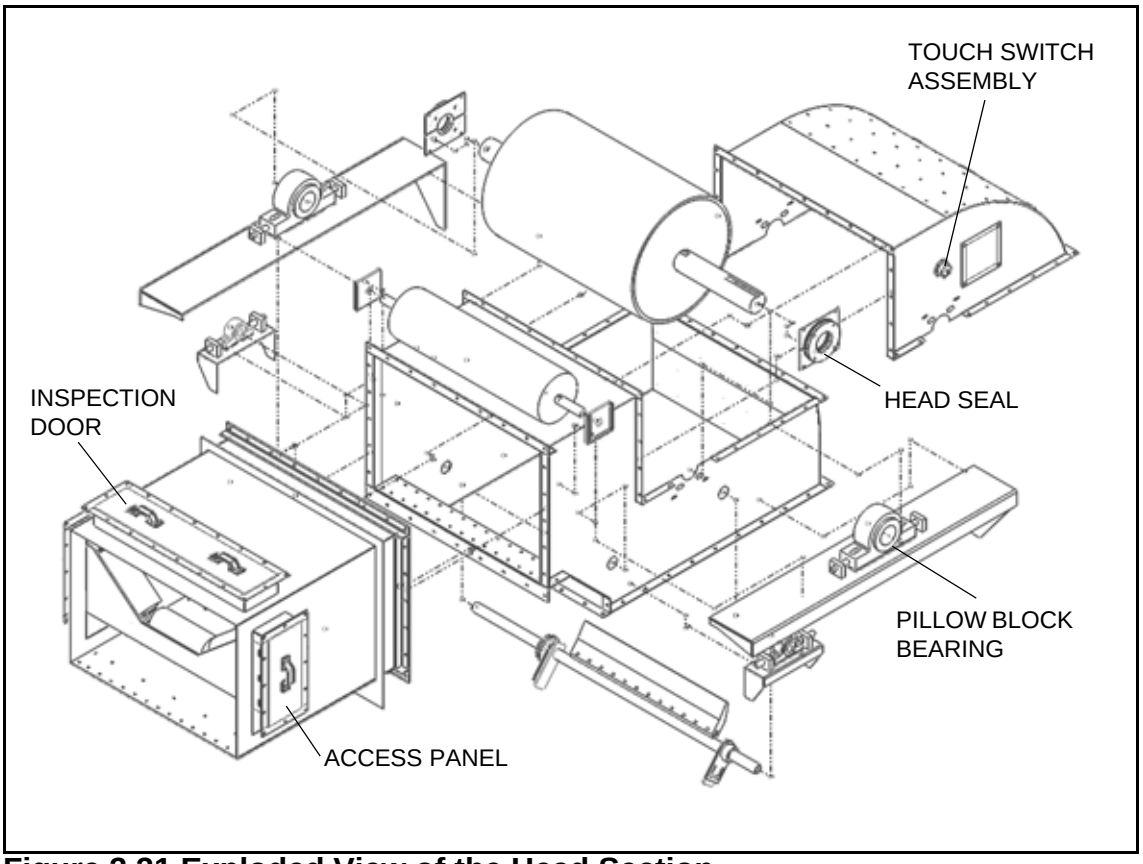


Figure 3.31 Exploded View of the Head Section

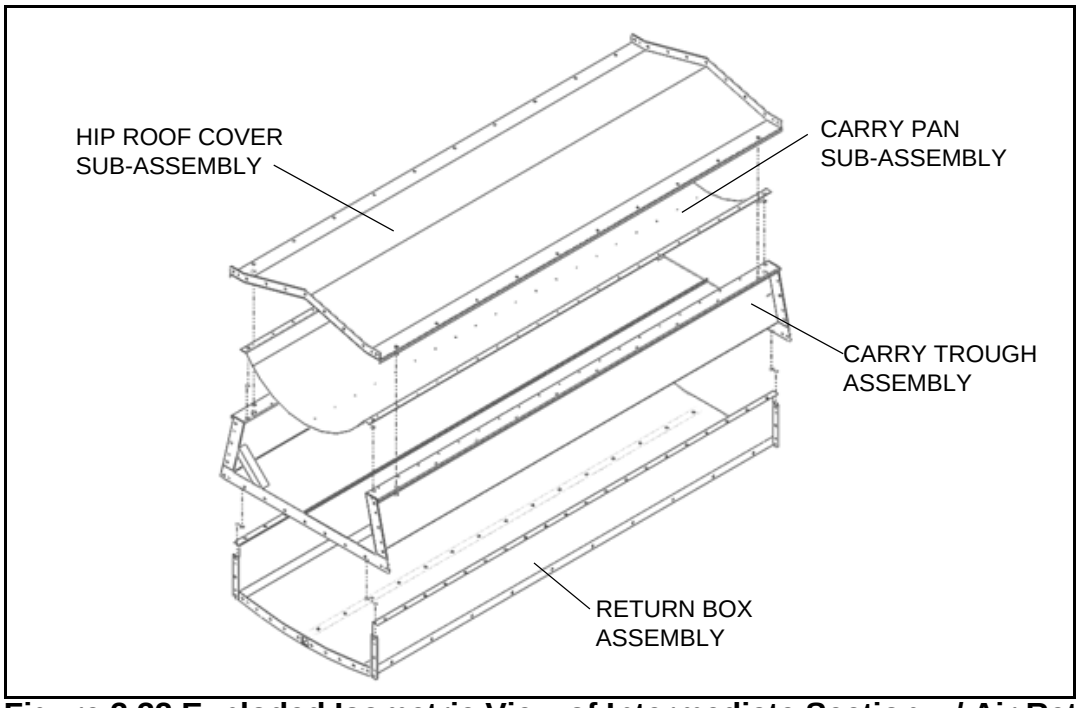


Figure 3.32 Exploded Isometric View of Intermediate Section w/ Air Return

Note: *It is possible, in certain situations, that the carry trough assembly and the return box assembly will be shipped to the job site un-assembled thus requiring the intermediate section to be assembled in the field. As the intermediate section is required to be air tight, the application of silicon to the mating surfaces is required. See section 3.5.4. step 5. for an illustration of the proper area in which to apply the silicon.*

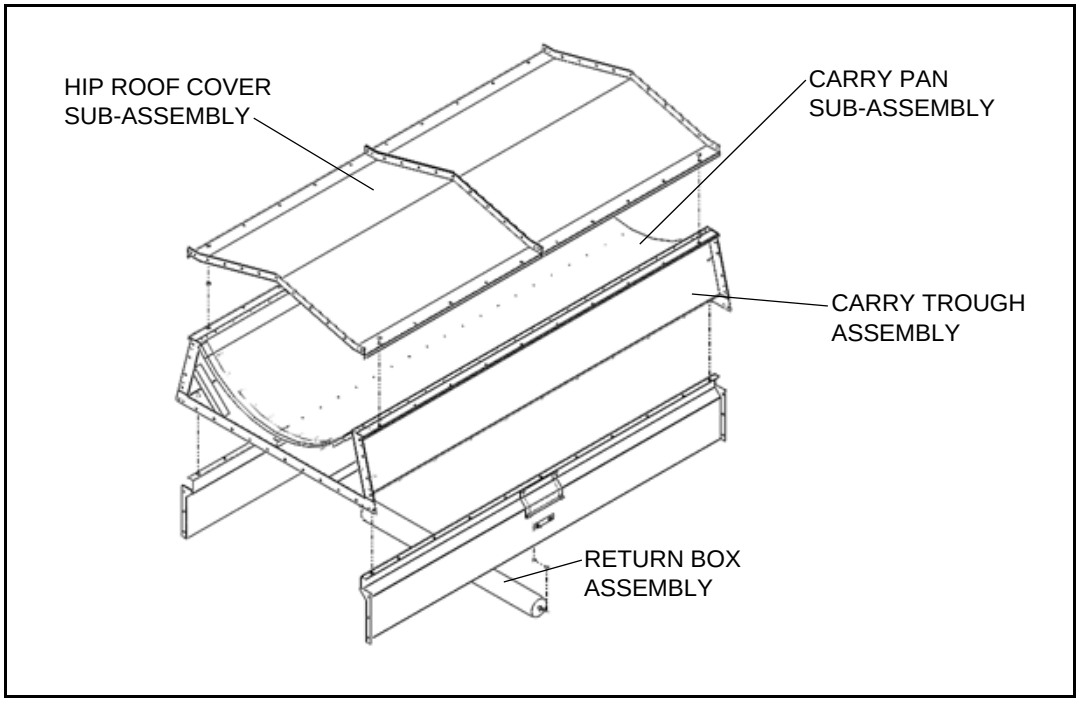


Figure 3.33 Exploded Isometric View of Intermediate Section w/ Roller Return

Note: *It is possible, in certain situations, that the carry trough assembly and the return box assembly will be shipped to the job site un-assembled thus requiring the intermediate section to be assembled in the field.*

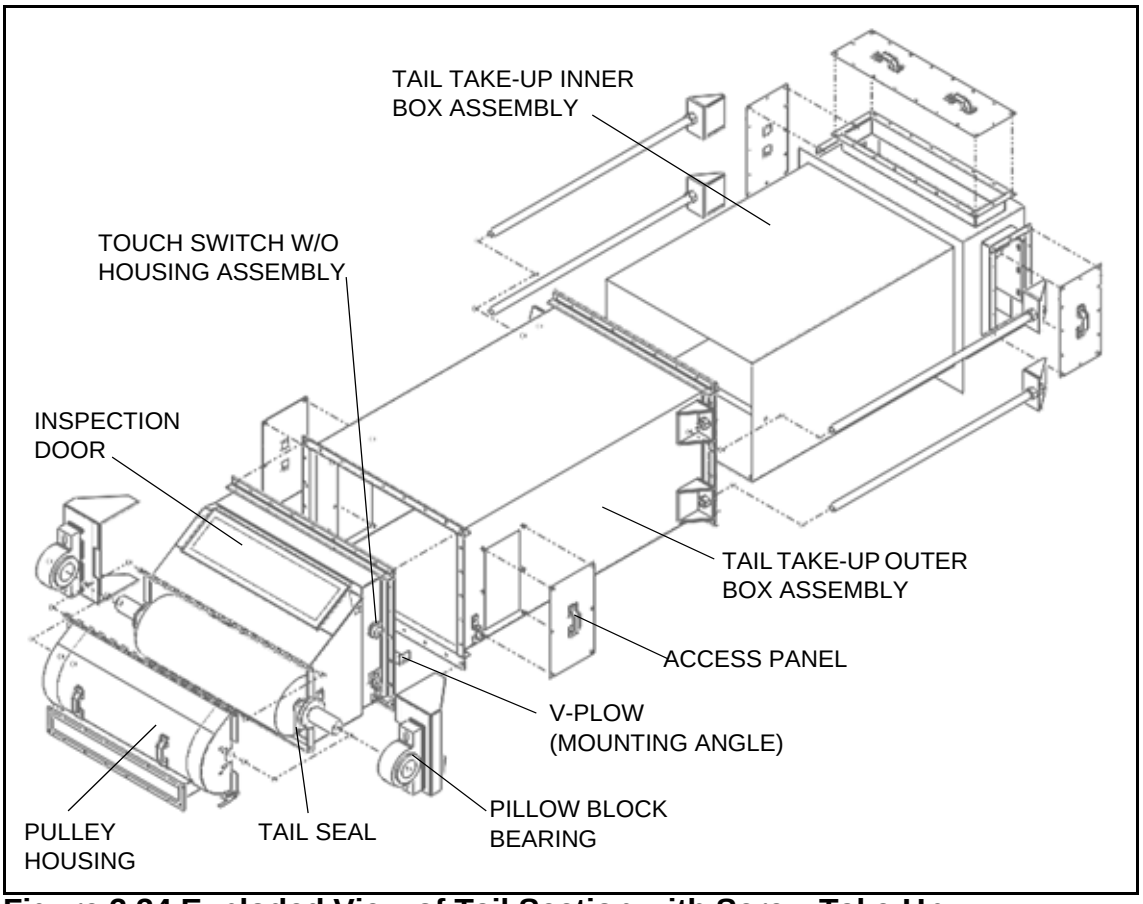


Figure 3.34 Exploded View of Tail Section with Screw Take-Up

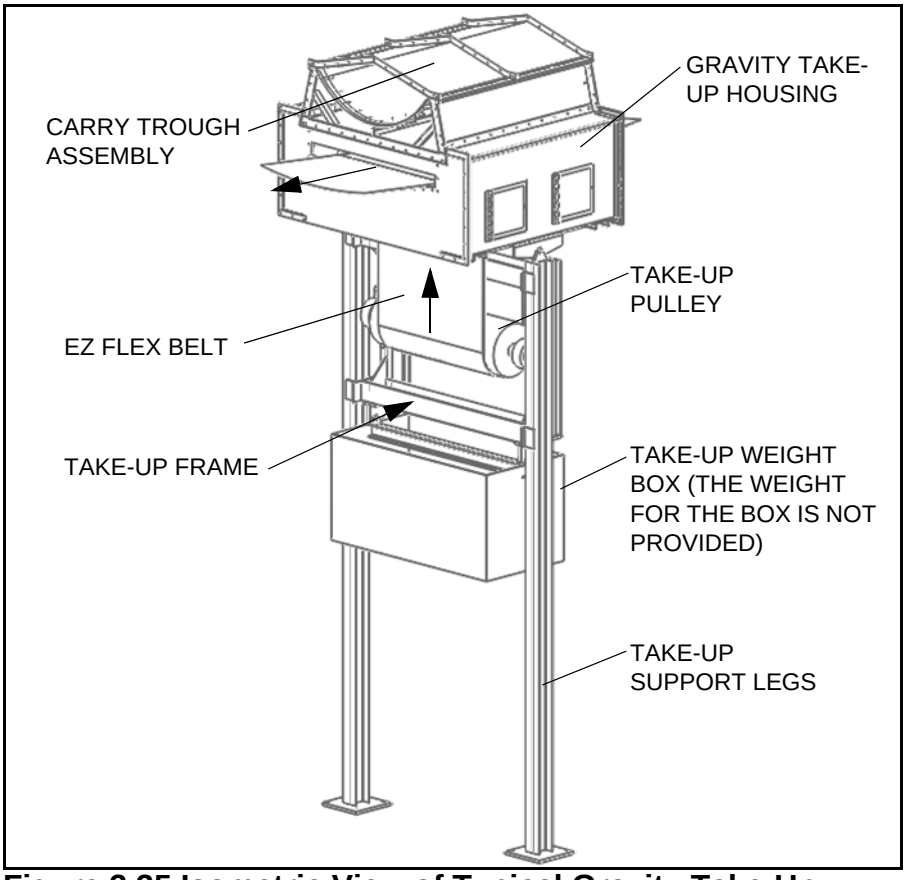


Figure 3.35 Isometric View of Typical Gravity Take-Up

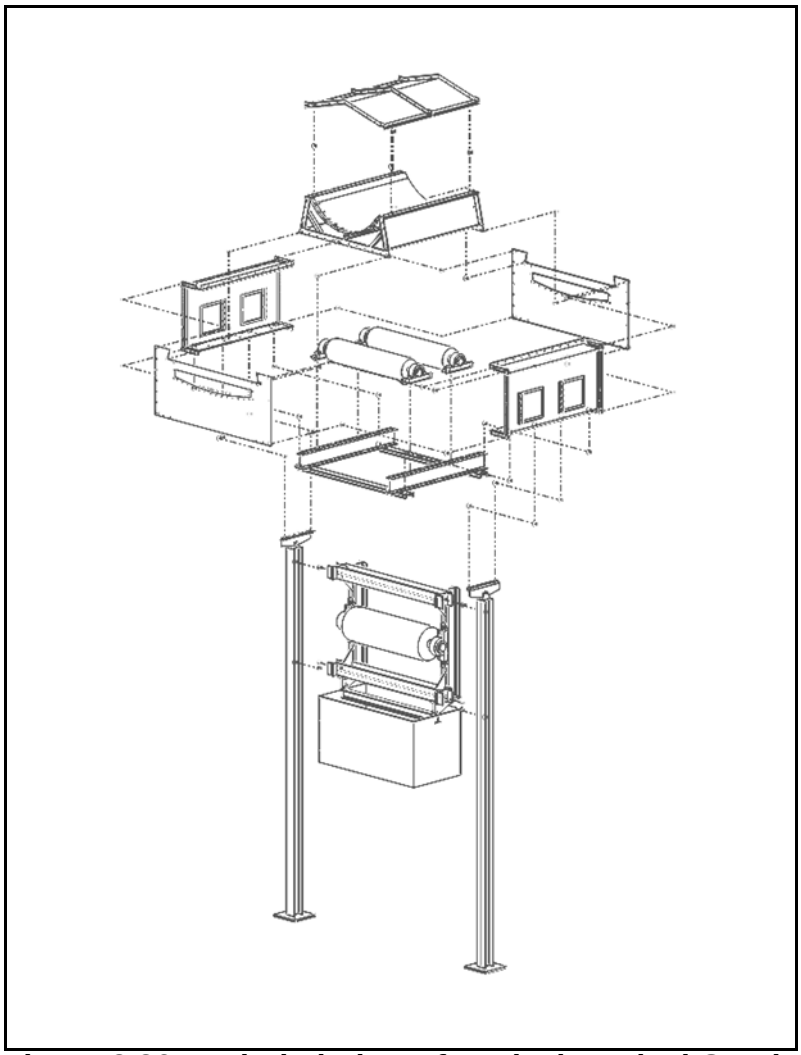


Figure 3.36 Exploded View of Typical Vertical Gravity Take-Up (Belt not shown for clarity)

4. Operation

WARNING *Before continuing, ensure you have read and understand the relevant information in the safety section. Safety information is provided to help prevent serious injury, death, or property damage.*

Important: *Do not operate JETBELT™ Air-Supported Conveyor unless the housing completely encloses the moving elements and power transmission guards are in place.*

4.1. PRE-OPERATION/CHECKLIST

Before operating the JETBELT™ conveyor check to ensure:

1. Lubricate all bearings and drives.
2. Check the interior of the conveyor to ensure all tools, foreign materials, and other obstructions have been removed.
3. Check that all hardware is secure.
4. Check all set screws on pulleys, bearings, sheaves, gear reducers, etc. Although some set screws may have been installed at the factory, shipment, handling, and installation could have loosened them. We cannot be responsible for damage caused by loose set screws.
5. Check that the head shaft is level.
6. Check for proper rotation of motor and gear reducer.
7. Adjust take-up screws so that there is no slack in the belt and so that the tail shaft is level.
8. Lubricate all bearings and drives according to service instructions. Bearings and gear reducers are normally shipped without lubricant. Refer to bearing and gear reducer manufacturer's service instructions for recommended lubricant.
9. Install all covers, guards, safety devices or controls, and any interlock to other equipment and ensure they are operating properly.

WARNING	
	Do not operate JETBELT™ conveyor unless the housing completely encloses the moving elements and power transmission guards are in place.

4.2. START UP

Operate the empty JETBELT™ conveyors for several hours as a break-in period. Look for bearing heat, unusual noises, or drive misalignment. Should any of these occur, check the following and take corrective steps.

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

NOTICE

Loose belts and misalignments of trough and pulley can require excessive maintenance and cause poor life expectancy.

2. Check assembly and mounting bolts and set screws; tighten if necessary.

Important: *After running the conveyor, stop it, lock out all power, and check discharge to ensure it is clear and material flow through the discharge will not be impeded in any way.*

3. Restart the conveyor and gradually feed material. Gradually increase feed rate until the design capacity is reached.

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

4. Cut off feed and allow the conveyor to empty. Lock out power supply. Check all bolts and all alignments. Re-align as necessary, tighten all bolts, and check belt adjustment.
5. Check motor amperage frequently.
6. Check belt tension periodically. It may be necessary to re-adjust belt tension after running material in the conveyor.

4.3. GENERAL OPERATION

1. 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.
2. Always operate the conveyor with covers, guards, and safety labels in place.
3. Always practice good housekeeping and keep a clear view of the conveyor loading, discharges, and all safety devices.
4. If the conveyor won’t be operated for a prolonged period of time, operate until cleared of all material. This is particularly important when the material conveyed tends to harden, becomes more viscous or sticky, or spoils if allowed to stand for a long period of time. .

NOTICE

After the first week of operation, check and re-tighten all bolts following the bolt manufacturer’s torque specifications.

NOTICE

Belt tension must be checked daily for the first several days, and then weekly until the belt has stabilized and adjustments are not required. This may happen quickly or over the space of a couple of months.

DANGER

Rotating parts hazard!

To avoid serious injury or death, keep body, hair, and clothing away from rotating pulleys, belts, chains, and sprockets. Keep all guards in place and in good working order. Lockout/ Tagout power before removing guard.

4.4. SHUTDOWN/STORAGE

If the conveyor will be shutdown for more than one month, perform the following:

1. Remove all foreign material from the conveyor and check that the surface coatings are in good order.
2. Lubricate and protect all bearings and drives according to the manufacturer's instructions.
3. Rotate the gear reducer periodically according to the manufacturer's instructions.
4. Protect the conveyor from weather, moisture, and extreme temperatures as required. Do not use plastic or other coverings that promote condensation under the covering.
5. Coat all exposed metal surfaces with rust preventative oil. Follow all the manufacturer's instructions that come with the rust preventative oil.
6. Prior to a subsequent start-up, perform the installation and operation instructions in this manual.

5. Maintenance

Proper maintenance habits on the conveyor mean a longer life, better efficiency, and safer operation. Please follow the guidelines below.

WARNING	
	Before performing any internal inspections or maintenance, ensure that a mechanical lockout/ tagout is in place on the motor starter.

Establish routine periodic inspections of the entire conveyor to help provide continuous maximum operating performance.

5.1. PERIODIC INSPECTION

Trough	Check for wear and alignment.
	Tighten all bolts to **manufacturer's torque specifications**.
Shafts/Pulleys	Check for wear.
Belt	Check for wear or damage.
Nuts & Bolts	Check for wear and tightness.
Seals	Check for leakage, adjustment, and wear.
Bearings	Check for lubrication and noise.
Sprockets	Check for wear and alignment.
Take-up	Check belt tension, (If take-up is fully adjusted, a section of belting will need to be removed).
Gear Reducer(s)	Check for oil level and noise.
Chain Drive	Check chain tension and adjust as required.
Guards	Check for oil level (if applicable). Check nuts and bolts for tightness.
Motors	Check amperage frequently. Verify it is within operating parameters.

5.2. BELT

5.2.1. EXAMINATION FOR WEAR

Periodically the belt should be examined for wear. The period between examinations may vary based on the power used, abrasiveness of material, shape of the conveyor, planned maintenance stops, etc. Regardless, the belt should be checked twice a year. In practice, maintenance records provide the best indication of belt deterioration. With good Maintenance Records, it's easier to predict when to replace the belt in any particular conveyor.

5.2.2. REPLACEMENT

The belt is required to be replaced when it becomes cracked, frayed, or burned beyond the point where traditional splicing or repairs can not be done safely. The maximum number of splices allowed per belt is three. Each splice should be spaced at least 10 feet from one splice joint to another. If repairing the belt requires more than three splices, the belt must be replaced.

Note: *If the belt was required to be replaced due to being burned or melted, then the lagging pads must be examined for damage.*

5.3. PULLEY LAGGING

JETBELT™ conveyors typically come with lagging pads fully secured to the surface of the head pulley. A lagging pad, with exceptional traction due to its unique design of double grooving and small molded “in slits” or “sipes”, yields an extra firm grip on the belt. The lagging pads have precisely formed steel backing plates to match each pulley. The lagging pads are bonded to the steel backing plates using hot-vulcanization under pressure. This results in lagging pad stability and long life. The self cleaning of the pulley surface occurs due to the spaces between the pads, the double grooving, and the pad sipes. Foreign material is forced to the edges of the pulley along the lagging spaces.

5.3.1. EXAMINATION FOR WEAR

Periodically examine the pulley’s lagging for signs of wear. The period between examinations should precisely match the examination times of the belt. Signs of wear include:

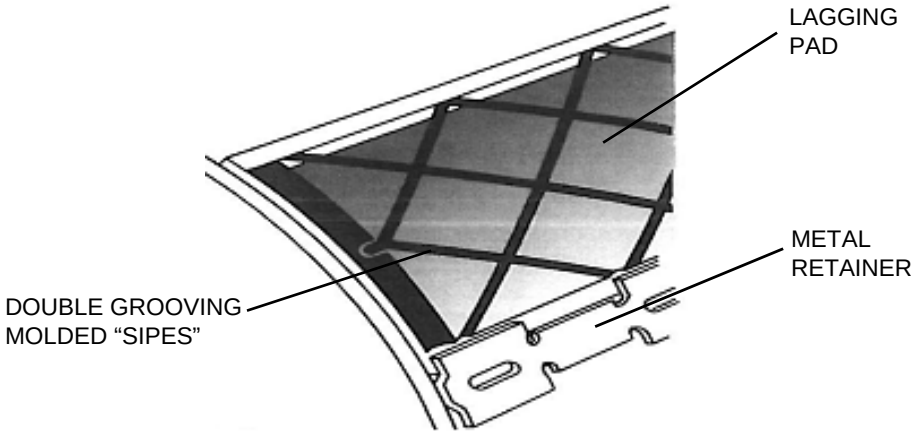
- Thinning of the lagging pad.
- Missing portions of the lagging pads.
- Separation of the lagging pad from the steel backing plate.
- Ashing or surface damage due from the belt being burned or melted.

5.3.2. REPLACEMENT

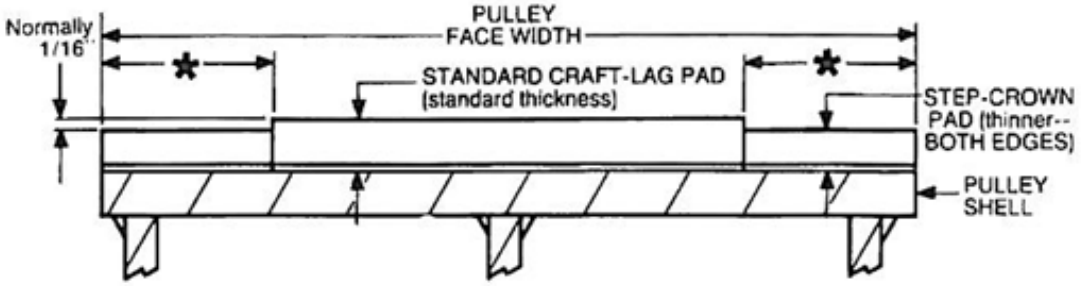
The lagging pads are design to be replaced without removing the pulleys from their operating position. The lagging pads are designed to fit under the lips of the metal retainers, which allow the lagging pads to slide in and out during installation.

- Remove the head access covers.
- Remove any other attachments that obstruct access to the pulley
- Loosen the belt (split the belt if necessary).
- Remove the fasteners holding the metal retainers onto the pulley.
- Remove the worn lagging pads.
- Replace the new lagging pads onto the pulley and tighten the metal retainers to fully secure the new lagging pads to the pulley.

Note: *In some cases it may be desirable to further amplify the tracking effects on a standard center-crowned or end-crowned pulley by adding a Step-Crown lagging pad in addition to the built in pulley crown.*



A. TYPICAL LAGGING PAD



B. STEP-CROWN LAGGING PAD

Figure 5.1

6. Troubleshooting

In the following section, we have listed some causes and solutions to some of the problems you may encounter in the field.

If you encounter a problem that is difficult to solve, even after having read through this troubleshooting section, please contact your local dealer or distributor. Before you contact them, please have this operation manual and the serial number from your machine ready.

WARNING	
	Fully disengage and lock out the power source before attempting any modifications or repairs.

PROBLEM	CAUSE	SOLUTION
Belt tracking	All portions of the belt are running to one side at a given point along the length of the conveyor.	Square up the idler pulleys directly preceding the trouble point.
		Advance, in the direction of travel, the end of the idler pulley that has shifted.
	Conveyor housing is crooked.	Straighten the entire conveyor.
	Sticking idler pulleys.	Clean and lubricate the idler pulleys.
	Build up of material on idler, head and/or tail pulleys.	Clean all the pulleys.
	Belt shifts to a low side of the conveyor housing.	Level the entire conveyor.
	Bowed belt.	Adjust tension on the belt.
		Cut out bow and splice in new section of belt.
	Conveyor belt runs to one side for a long distance while loaded.	Check if the load is off center.
		Adjust material loading.
	Increase the tension to get the belt to conform to the crown of the pulleys.	Belt is too stiff to track properly. Replace with less stiff belt.
		Increase the tension to get the belt to conform to the crown of the pulleys.
	Tail pulley not properly aligned with head pulley.	Verify that the head pulley is square and plumb.
		Align the tail pulley with the head pulley.
		Verify all the idler pulleys are aligned with the head and tail pulleys.

PROBLEM	CAUSE	SOLUTION
Premature trough failure	Gauge too thin.	Increase thickness. Consult Tramco, Inc. for recommendations.
	Belt rubbing on the housing.	Re-align the belt.
	Excessive belt speed.	Check belt speed.
Accelerated belt wear	Belt is too tight.	Reduce tension on the belt.
	Speed is too high.	Reduce speed. Consult Tramco, Inc. to determine proper belt speed.
	Foreign objects.	Remove foreign objects.
Belt breakage	Worn belt.	Replace belt if worn.
	Take-up is loose.	Adjust take-up.
	Obstruction in conveyor.	Remove obstruction.
	Pulley mis-alignment	Align pulleys.
	Plugged discharge.	Remove material from discharge.
	Overloading conveyor.	Regulate feed into conveyor.
Drive shaft breakage	Excessive torque.	Recalculate horsepower requirements.
	Insufficient torque capacity.	Increase shaft diameter
		Change shaft material.
	Obstruction in conveyor.	Remove obstruction.
	Overloading conveyor.	Regulate feed into conveyor.
Bearing failure	Material getting into bearing.	Add or upgrade seal to keep material out of bearing
		Change outboard bearing.
	Insufficient/Excessive lubrication	Lubricate properly. Follow manufacturer’s specs.
	End thrust is causing bearing failure.	Properly install bearing to eliminate end thrust on bearing.
Motor/Heaters overload	Amperage demand too excessive for motor. Incorrect motor size.	Recheck horsepower calculations.
		Check material properties. (In field conditions)
		Verify capacity is within established design parameters.
		Regulate feed rate.
Capacity	Rated capacity not being reached.	Verify belt speed matches the design specifications.
		Check belt speed under full load.
		Make sure the head pulley is not slipping.
		Re-check design specifications.

PROBLEM	CAUSE	SOLUTION
Discharge	Conveyor plugging up and shutting down.	Discharge plug switch must be located to detect a plug and shut down the conveyor
	Rated capacity is not reached.	Check the size of the spouting.
		Check the spouting angle. Make sure it is not too flat to allow the material to flow at conveyor capacity.
Loading problem	Material is spilling off the belt.	Verify that the skirt is adjusted properly.
		Increase the conveyor speed or reduce the inlet feed rate.
V-Plow	Splice hitting in the tail section.	Adjust V-Plow. Refer to Section 3.3.5.

TERMS AND CONDITIONS OF SALE

LIMITED WARRANTY AND TERMS OF SALE WARRANTY:

TRAMCO, INC. products are sold with a warranty against defects in material and workmanship for a period of one year from the date of their delivery to the purchaser or their delivery to the carrier in the case of F.O.B. Shipments. TRAMCO, INC.'s warranty shall be limited at TRAMCO, INC.'s option to repair or replacement of any defective parts or components. Such repair or replacement shall be the purchaser's exclusive remedy hereunder and correction of defects shall constitute complete fulfillment of all obligations and liabilities of TRAMCO, INC. with respect to the product sold hereunder, whether based in contract, tort, or otherwise. The determination of a defective condition shall be made by TRAMCO, INC. in its sole discretion.

LIMITATION OF LIABILITY:

TRAMCO, INC. shall not be liable, in contract, tort, or otherwise, for any special indirect, incidental, or consequential damages, such as, but not limited to, loss of profits, loss of production, or for injury or damage, caused by reason of the installation, modification, use, repair, maintenance, or mechanical failure of any TRAMCO, INC. product. TRAMCO, INC.'s warranties hereunder extend only to the direct customer of TRAMCO, INC. TRAMCO, INC. makes no warranties of any kind with respect to improperly installed product or equipment unless the direct customer of TRAMCO, INC. (or first user, as the case may be) first fully discloses in writing to TRAMCO, INC. the method and details of the proposed installation and the intended use of the product or equipment and TRAMCO, INC. approves in writing of such method and details. TRAMCO, INC. makes no warranties when damage results from the failure to follow instructions in the manual or in safety labels attached to the TRAMCO, INC. system. The purchaser or user of any TRAMCO, INC. equipment shall be responsible for all ordinary maintenance, adjustments, and cleaning of the product. In the event that the TRAMCO, INC. product is not properly maintained, all warranties by TRAMCO, INC. are null and void. Certain of the component parts of the TRAMCO, INC. product are purchased from other vendors. TRAMCO, INC. warrants these component parts only to the extent of the vendor's warranties. TRAMCO, INC. shall repair or replace such component parts in accordance with the vendor's warranty policy only if TRAMCO, INC., in its sole discretion, determines such component parts to be defective.

LOSS, DAMAGE OR DELAY:

TRAMCO, INC. shall not be liable for any loss, damage, detention or delay resulting from any cause beyond its reasonable control, including, but not limited to, fire, strike or other concerted action of workmen, act or omission of any governmental authority or of the purchaser, insurrection, riot, embargo, transportation, shortage, delay or wreck, or inability to obtain labor or material from usual and customary sources.

WARRANTY DISCLAIMER:

TRAMCO, INC. MAKES NO WARRANTIES OTHER THAN THOSE STATED HEREIN, AND THESE WARRANTIES ARE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING BY WAY OF EXAMPLE AND NOT BY WAY OF LIMITATION, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ALSO IN LIEU OF ANY OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF TRAMCO, INC..

MODIFICATIONS:

The prices and terms of this offer are not subject to verbal changes or other agreements unless approved in writing by an authorized representative of TRAMCO, INC. management. No representation or warranty, express or implied, made by any sales representative or any agent or employee of TRAMCO, INC. which is not specifically set forth herein shall be binding on TRAMCO, INC. unless approved in writing by an authorized representative.

TAXES:

Unless otherwise noted, the price does not include any state or local property, sales, use, or privilege tax or license. If any such charge should be enforced by virtue of the transaction described herein, the purchaser agrees to pay the same or reimburse TRAMCO, INC., as the case may be.

LOSS OR DAMAGE IN TRANSIT:

Any claim for loss or damage to products in transit must be entered and prosecuted by the purchaser.

RISK OF LOSS:

Delivery shall occur and the risk of loss shall pass to the purchaser upon delivery of the material to the carrier at the point of shipment. Any claim of loss or damage in transit shall be against the carrier only.

GENERAL PROVISION:

The failure of TRAMCO, INC. to enforce any right will not be construed as a waiver of TRAMCO, INC.'s rights to performance in the future. The purchaser may not assign any rights or delegate any performance owed under this agreement without the express written consent of TRAMCO, INC. management.

CLAIM/NOTICE OF DEFECTS:

In the event the purchaser claims that a TRAMCO, INC. product is damaged upon receipt, TRAMCO, INC. shall be given an equal opportunity for inspection, or, upon request, shall be furnished a sample of such product. The purchaser shall set aside, protect and hold such products without further processing until TRAMCO, INC. has an opportunity to inspect and advise the purchaser as to the disposition, if any, to be made of such products. In no event shall any TRAMCO, INC. product be returned, re-worked, or scrapped by the purchaser without the express written authorization of TRAMCO, INC.

PATENT RIGHTS:

The purchaser agrees not to violate or infringe the patent rights relating to any TRAMCO, INC. product or any other patent rights under the control of TRAMCO, INC. or under which TRAMCO, INC. has the right to manufacture or sell. The purchaser also agrees not to contest TRAMCO, INC.'s title to any and all such patent rights, nor the validity or scope thereof. The purchaser assumes liability for patent or copyright infringement when goods or products are made to the purchaser's specifications.

NON-INCORPORATION:

Any terms inconsistent with those stated herein which may appear in the purchaser's formal order or in any proposal for additional or different terms, or any attempts by the purchaser to vary in any degree any of the terms of this offer, are hereby objected to and rejected, but such proposal shall not operate as a rejection of this offer unless such variances in the terms and the description, quantity, price or delivery schedule of the goods or products are deemed a material alteration thereof, in which event this offer shall be deemed accepted by the purchaser without said additional or different terms.

GOVERNING LAW:

All disputes arising out of this offer and purchase order shall be governed by the laws of the State of Kansas.

JURISDICTION AND VENUE:

The purchaser consents to the personal jurisdiction of the federal and state courts in the State of Kansas, waives any argument that such a forum is not convenient, and agrees that any litigation relating to this offer and purchase order shall be venue in either the Circuit Court of Sedgwick County, Kansas, or the Federal District Court, District of Kansas.

SEVERABILITY:

If for any reason any one or more of the provisions contained in this offer are held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, and unenforceability shall not affect any other provision hereof and this offer shall be construed as if such invalid, illegal, or unenforceable provision had never been contained herein.

ATTORNEYS' FEES:

The purchaser agrees that in the event there is a dispute between the parties including, but not limited to, arbitration or litigation, that the purchaser shall pay to TRAMCO, INC. all costs involved in such dispute and all other out-of-pocket expenses, including in each case reasonable attorneys' fees and the court costs incurred by TRAMCO, INC. in such dispute.

ERRORS:

Typographical and stenographic errors contained in this offer are subject to correction by TRAMCO, INC. without liability.

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