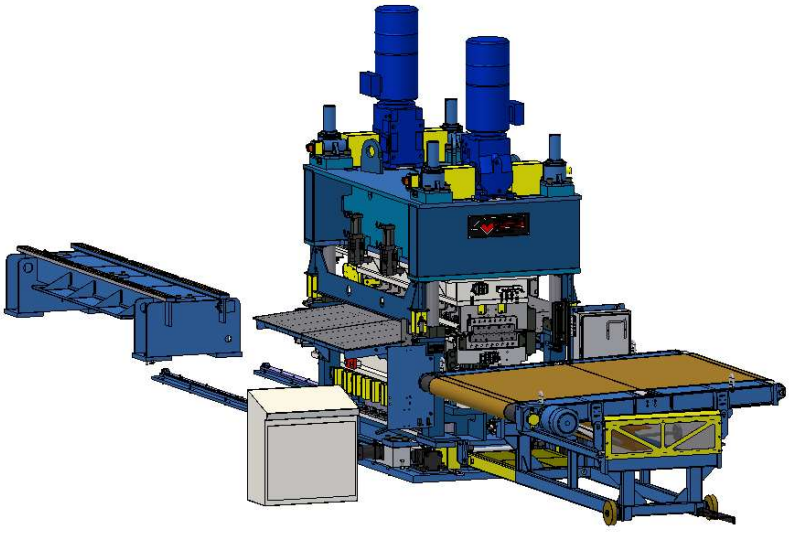
Machine Concepts

Designers & Builders of Innovative Metal Processing Equipment

Leveler Overview



JOB NO.:	**14-410-N**
Dated:	**July 15, 2015**
Part No:	**G3C-S280-W80-D1.75**
Customer:	**Alcoa San Antonio Works San Antonio, Texas**
Customer P.O. #:	**140448915**
Dated:	**September 19, 2014**

Table of Contents

Note: For replacement parts, please reference the drawing section.

Note: For operating instructions of these components please refer to the Operators Manual.

Section 1: Introduction

Note: Please thoroughly review the "Principals of Leveling Manual" and "Controls Manual", which were shipped with this equipment, prior to attempting to operate this machine.

The material specification outlines the loading that the machine will be subject to. While a small work roll dia. will increase your leveling capability, it cannot withstand the higher separating load that the thicker gage product will transmit through the machine. Conversely, while a larger work roll diameter can withstand the increased separating load, leveling capability is sacrificed for the thinner gage product. The understanding of the leveler's ideal product range will result in less maintenance problems, increased productivity and a better overall quality leveled product.

Below is the original material specification. These are the parameters this equipment was originally designed to level. While this machine has inherent safety overload protection, please pay close attention to the capacity charts below to understand the limitations to this machine.

Material Specifications:

Material:	Aluminum Alloys	
Width:	42 to 80 inch	1067 to 2032 mm
Gauge range:	.020 to .170 inch	0.51 ~ 4.32 mm
Yield:	12,000 to 35,000 PSI	
Capacity:	See charts	

Leveler Specifications:

Configuration	Drawer Type Cassette, Pull Thru, Traversing Leveler	
Separating load capacity:	280,000 lb	
Qty of backup flights:	9	
Pass line height:	48 inch	1219 mm
Process orientation:	Always on center line	
Direction of process:	Left to Right	
Cassette roll out:	Drive Side	
Power requirement:	460 Volt, 3 Phase	

Work Roll Specifications:

Work roll Diameter:	1.75 inch	44.45 mm
Work roll face:	92 inch	2364 mm
Qty of work rolls:	17	
Roll finish:	Hardened, Ground, & Polished 52100 Steel Chrome Plated	
Roll configuration:	6 High (intermediate rolls on top and bottom)	
Line Speed:	175 to 520 FPM / 53 to 158 MPM (Gauge Dependant)	

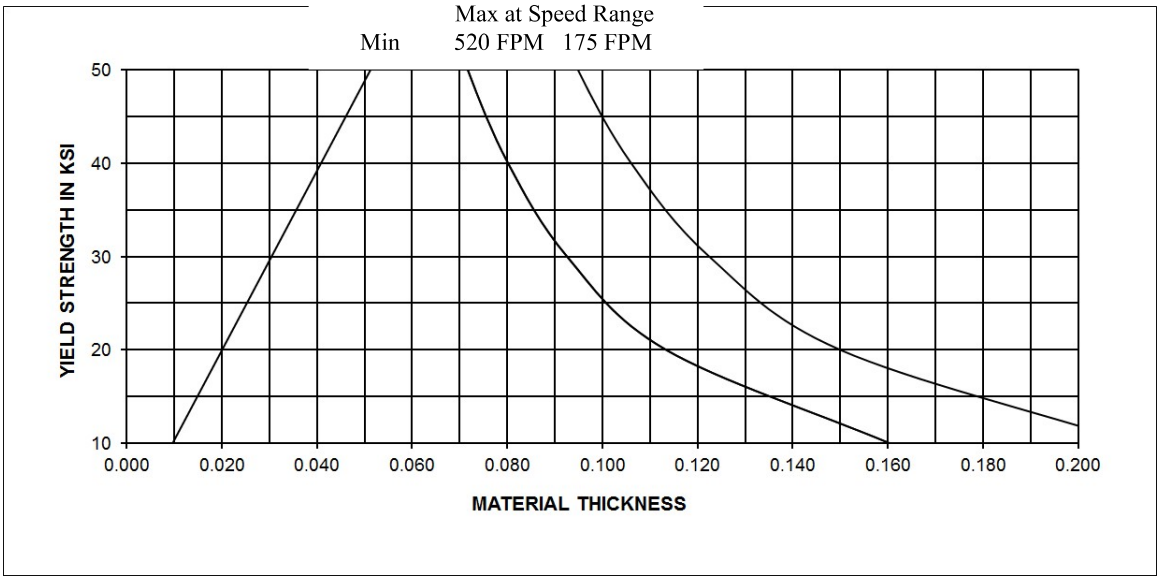
Drive System:

Drive type:	Pull Thru - With Roll Cleaning

Section 2: Leveler Capacity Chart

The capacity chart is a graphical display showing the operator which materials can effectively be leveled by a specific roll diameter. The far left curve represents borderline affective leveling and the far right curve is where overloading of the machine occurs. Try to stay within these two curves in order to obtain the best results.

Capacity Chart for 1.75" Dia. Rolls – Aluminum



Maximum thickness is based on machine capacity
Minimum thickness is calculated based on achieving a minimum 70% in yield.
Even though the min capacity is shown as a defined line, in reality leveling capacity diminishes gradually as the material approaches the line. Leveling can also be achieved to the left of the line but at reduced performance.

Section 3: Upper Leveler Frame

The main function of the upper leveler frame (Figure 3.1) is to adjust the work roll assembly into position based on the input parameters that the operator enters. All (4) corner posts are tied together and can be adjusted by means of four 35-ton machine screw jacks driven by two 40 HP variable speed AC motors. The upper frame is also designed to support 280,000 lbf. of separating load generated from the material leveling process.

In order to clamp the cassette to the upper frame, (8) Ø3.25" X 3.00" stroke pneumatic cylinder clamp assemblies are used. Four clamps on each side of the leveler frame secure the upper cassette to the bottom side of the upper leveler frame.

Primary components of the upper frame assembly are illustrated below in Figure 3.1.

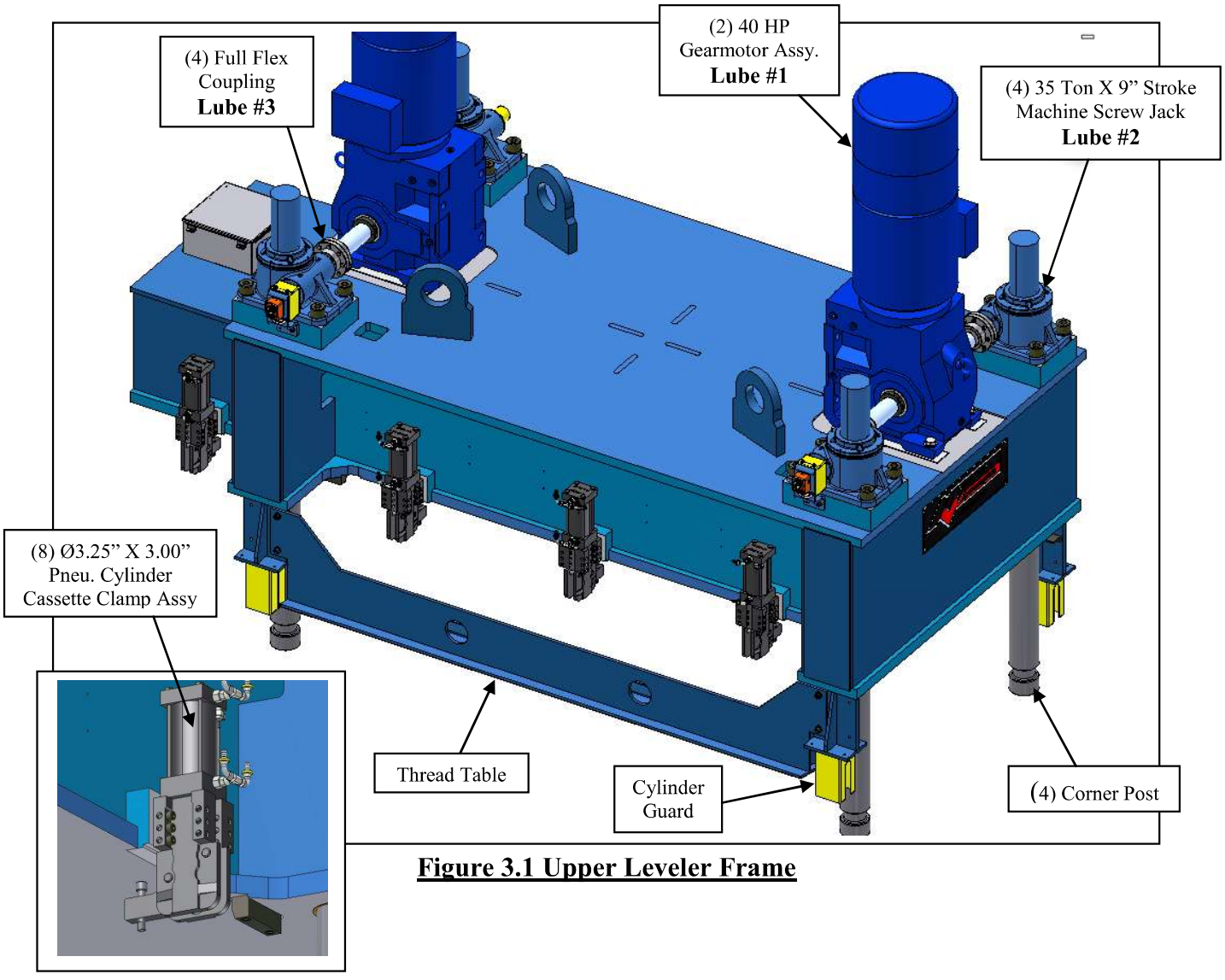


Figure 3.1 Upper Leveler Frame

Section 4: Lower Leveler Frame

The lower leveler frame is used to support the separating load created during leveling. The frame incorporates (9) Ø5.00" X 1.00" stroke hydraulic cylinders, used for entry work roll penetration as well as roll bending. The lower frame is connected to the upper frame by (4) post clamps located at the corners of the lower frame. Four Ø2.50 X 2.00 hydraulic cylinders are used to push up on the upper frame, taking out any backlash in the (4) 35–ton corner screw jacks.

Primary components of the lower frame assembly are illustrated below in Figures 4.1 and 4.2.

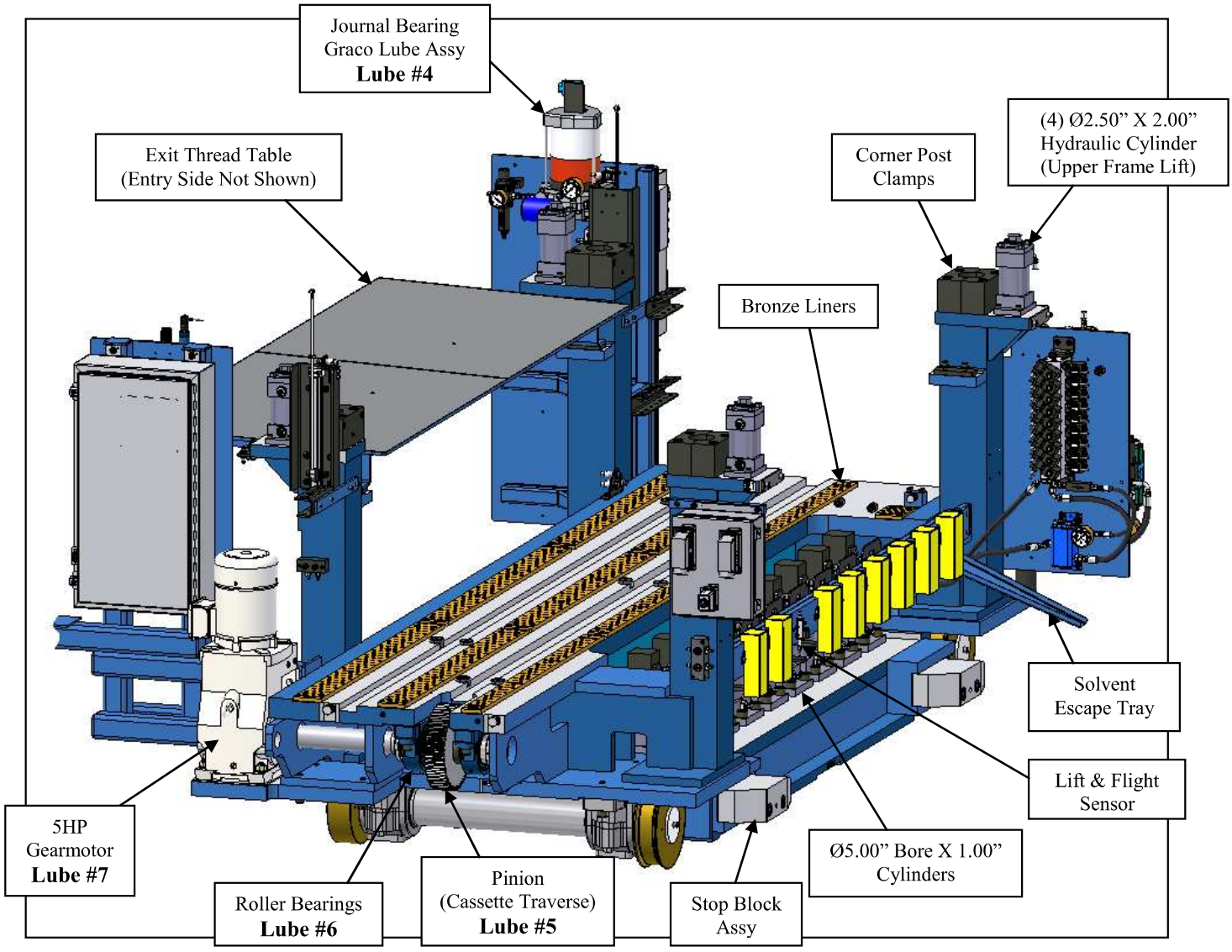


Figure 4.1 Lower Leveler Frame

The lower frame is also used to traverse the cassette in and out of the leveler for maintenance, inspection, ect. This is accomplished by using a 5 HP gear motor and gear pinion that pushes and pulls the cassette assembly via a mating gear rack, bolted to the bottom of the lower cassette assy. The "cassette" traverse drive train is shown in Figure 4.1. Also located on the lower leveler frame is the journal bearing lubrication pump assembly.

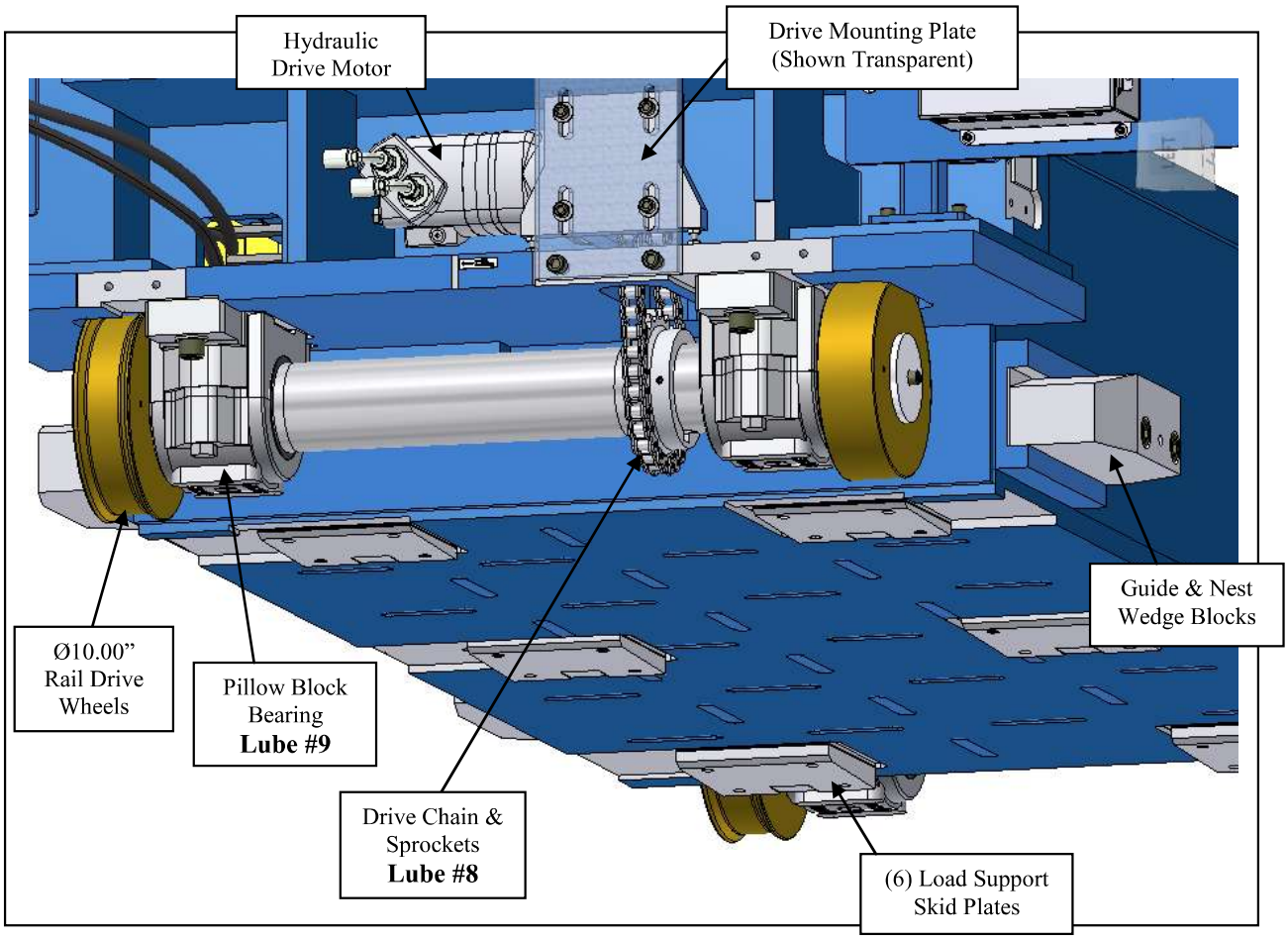


Figure 4.2 Leveler Traverse Drive

The lower leveler frame assembly incorperates a hydraulic motor & sprocket chain drive to traverse the entire leveler out of the process line during "high temperature" line processes. Ø10.00" wheels traverse on the fixed traverse base assembly rails. Six wedge shaped skid plates mate with apposing skid plates to support the live load of the operating leveler while nested in the fixed traverse base assembly. The "leveler" traverse drive train is shown in Figure 4.2.

Section 5: Fixed Traverse Base Assembly

The fixed "leveler" traverse base assembly incorporates a rigid base frame to support the live load of the leveling process. It also accomodates removal of the leveler from the process line during "high temperature" processes. Extended rails allow the leveler to traverse in and out of nested position; six 2° wedge skid plates support the load of the leveler while nested. Four hydraulic cylinders clamp the leveler in nested position and two hydraulic cylinders eject the leveler from the skid plates for traversing out of the process line.

Primary components of the fixed traverse base assembly are illustrated below (figures 5.1 and 5.2). Refer to drawings D-190370-SA and D-109371-SA for additional information.

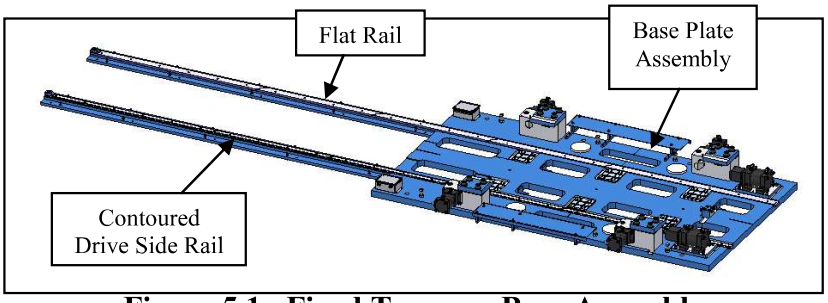


Figure 5.1 Fixed Traverse Base Assembly

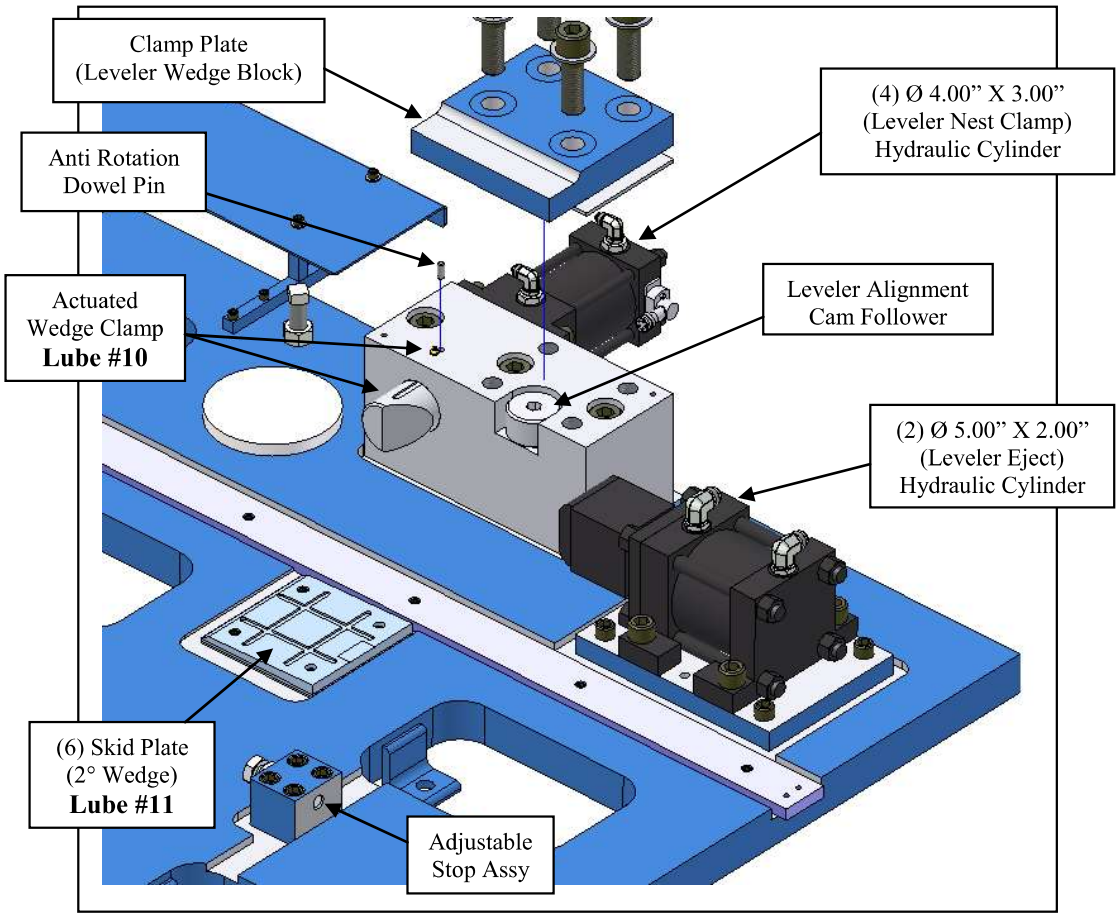


Figure 5.2 Base Assembly Nesting

Section 6: 1.75” Upper Work Roll Cassette & Roll Clean Drive

The upper cassette (Figure 6.1) consists of (9) flights of fixed back-up bearing supports. The back-up bearing rails support (8) work rolls and (9) intermediate rolls. The intermediate rolls are used to prevent shadow marks from forming on the strip. The upper and lower work roll journal bearings are greased automatically through a lubrication system. The grease is metered based on how much footage is run through the machine.

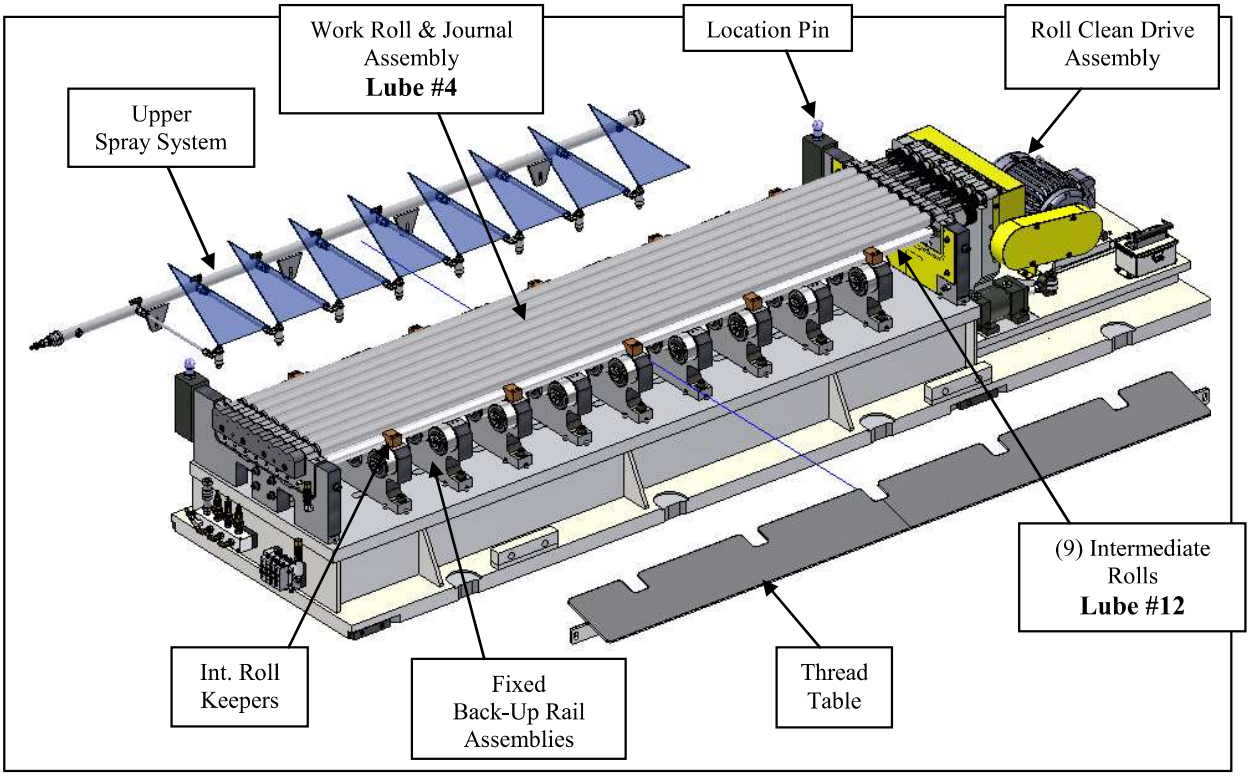


Figure 6.1 1.75” Dia. Upper Cassette Assembly

The upper work roll assembly can be removed from the cassette assembly. Refer to the Maintenance Schedule section for removal instructions.

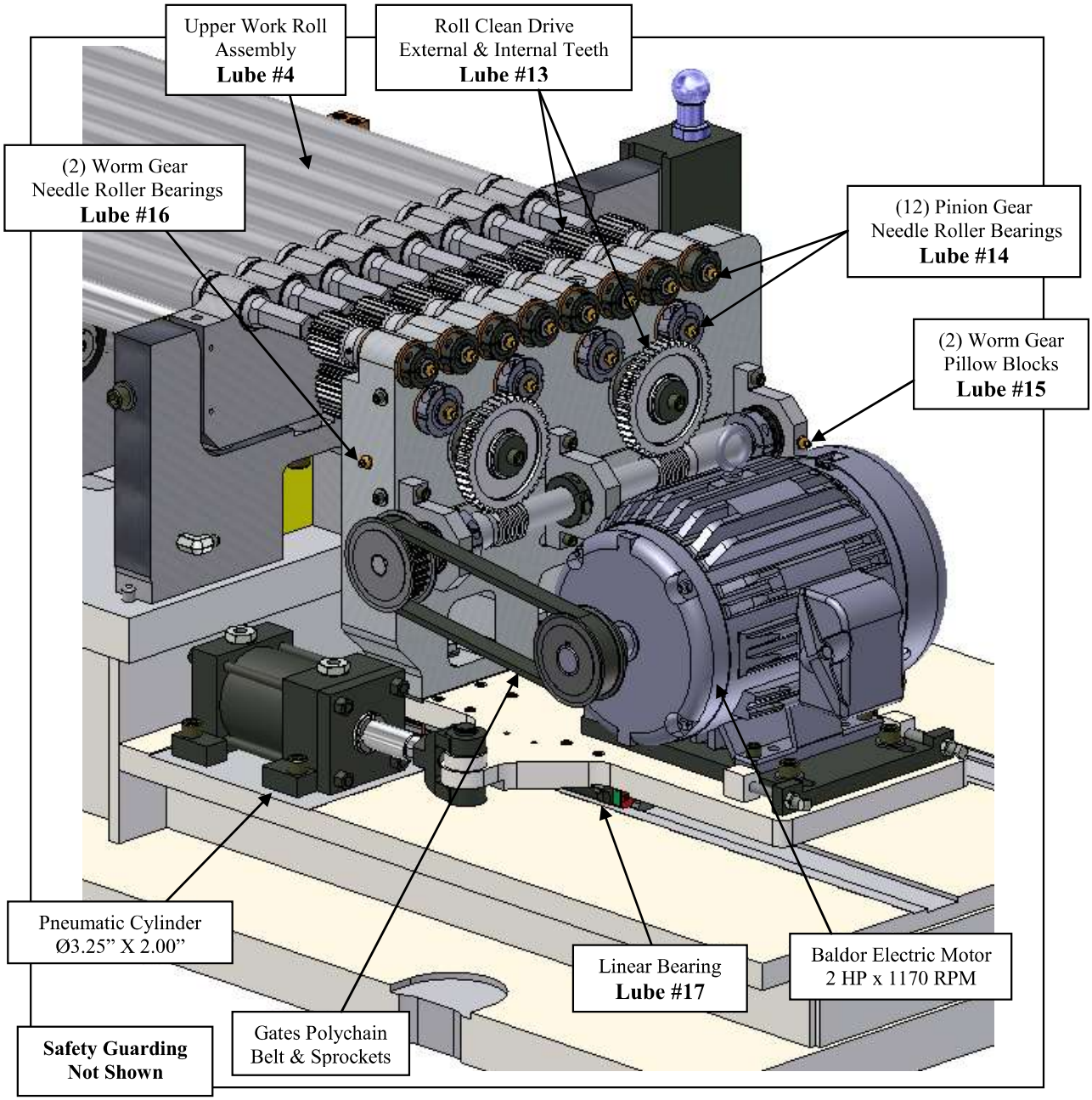


Figure 6.2 Upper Roll Clean Drive (Shown Disengaged)

Located on the upper cassette assembly is the roll clean drive assembly. The work rolls are not driven except for work roll cleaning operations. Actuated by a pneumatic cylinder, the entire assembly is pulled into engagement with the upper work roll assembly. The work rolls are then driven to rotate in a forward / reverse motion. A Scotch Bright / felt media combination pad is placed between the roll bite, scrubbing the roll face. The clean drive gears are driven via a 2 horsepower a.c. motor.

Primary components of the work roll clean drive assembly are illustrated above in figure 6.2. Refer to drawing D-108759-SA for additional information.

Section 7: 1.75” Lower Work Roll Cassette & Roll Clean Drive

The lower cassette (Figure 7.1) consists of (9) flights of fixed back-up bearing supports. The back-up bearing rails support (9) work rolls and (10) intermediate rolls. The intermediate rolls are used to prevent shadow marks from forming on the strip. The upper and lower work roll journal bearings are greased automatically through a lubrication system. The grease is metered based on how much footage is run through the machine.

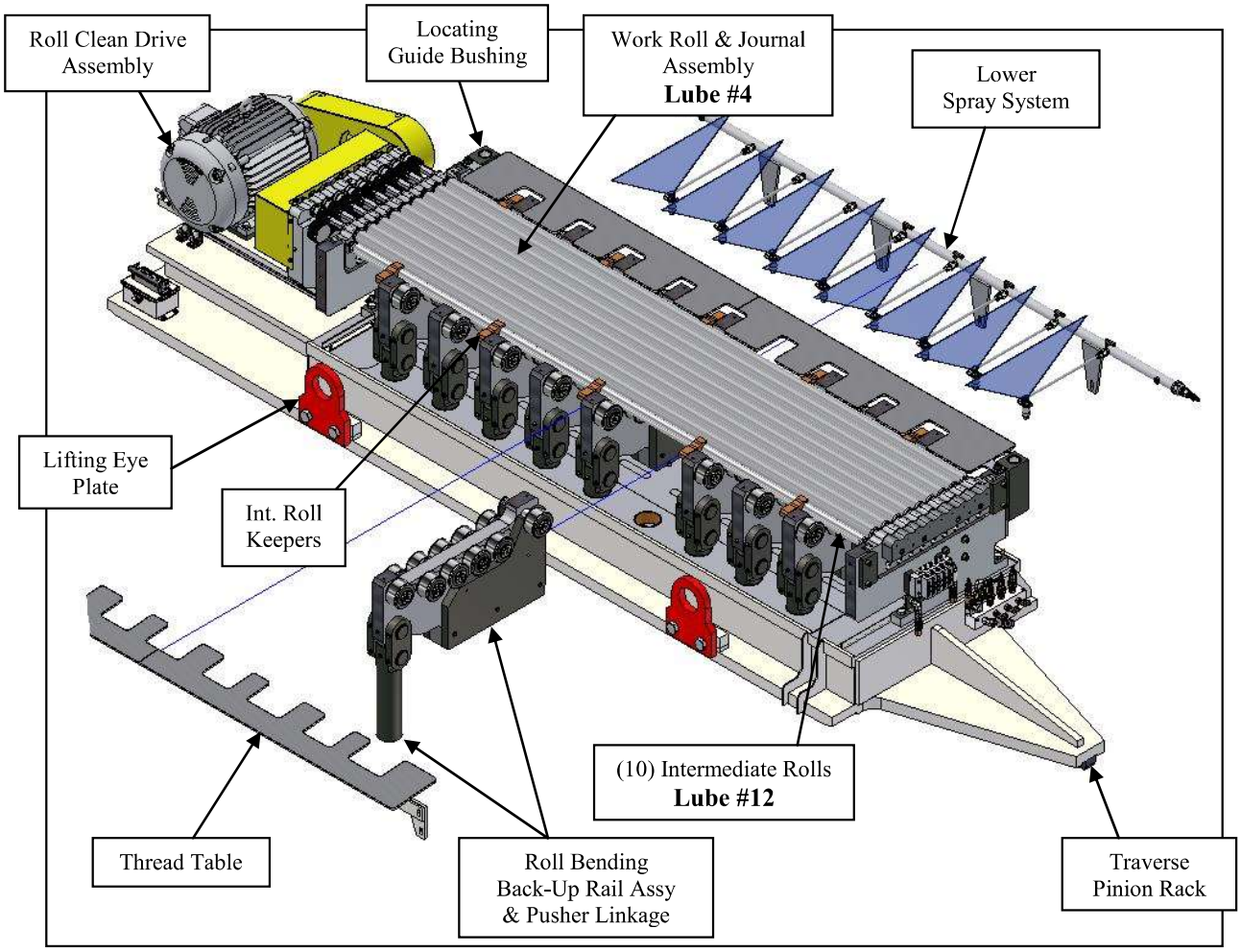


Figure 7.1 1.75” Dia. Lower Work Roll Cassette

The lower work roll assembly can be removed from the cassette assembly. Refer to the Maintenance Schedule section for removal instructions.

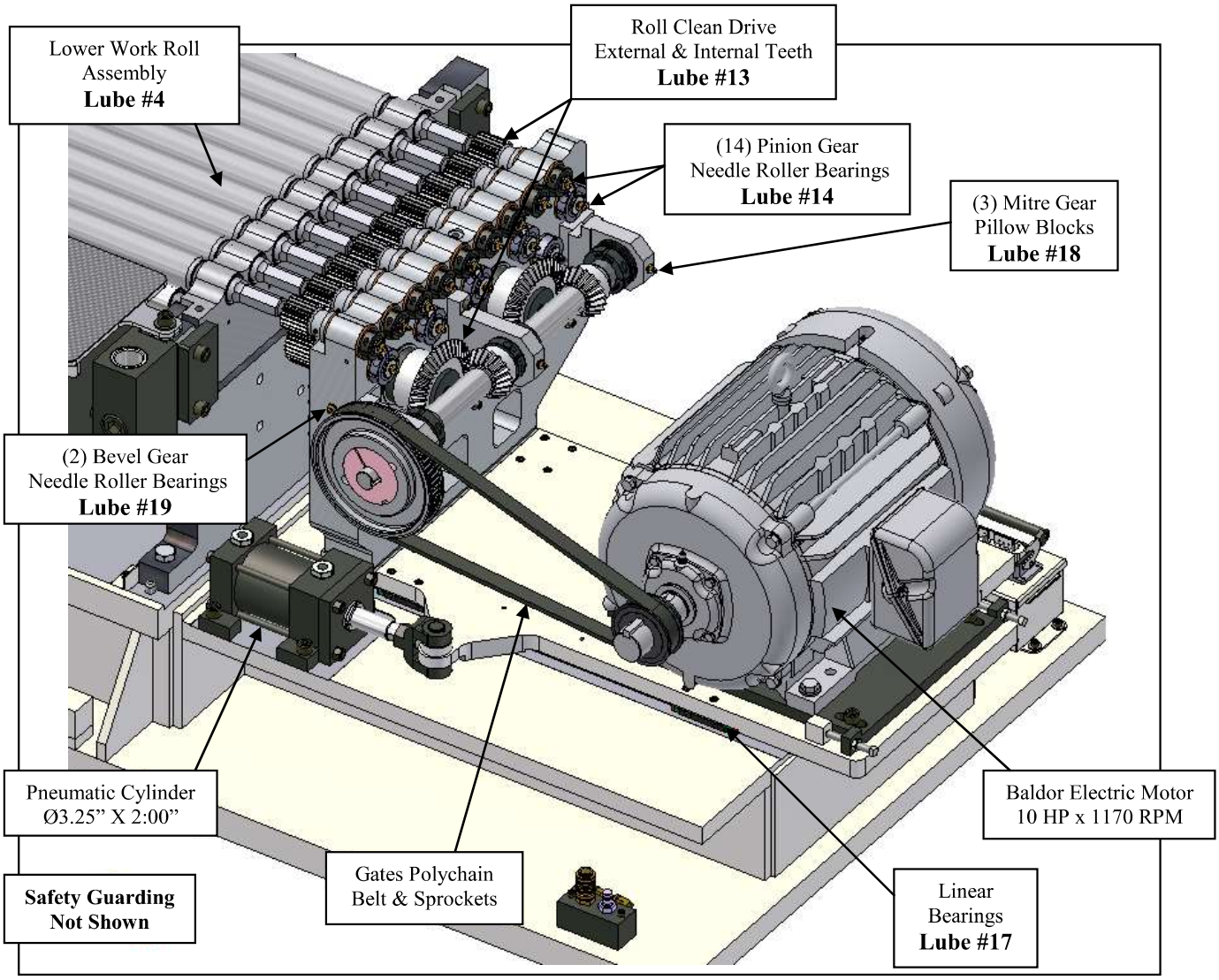


Figure 7.2 Lower Roll Clean Drive (Shown Disengaged)

Located on the lower cassette assembly is the roll clean drive assembly. The lower work rolls are **not driven except during threading and work roll cleaning operations**. Actuated by a pneumatic cylinder, the entire assembly is pulled into engagement with the upper work roll assembly. The work rolls are then driven to rotate in a forward / reverse motion. A Scotch Bright / felt media combination pad is placed between the roll bite, scrubbing the roll face. The clean drive gears are driven via a 10 horsepower a.c. motor.

Primary components of the work roll clean drive assembly are illustrated above in figure 7.2. Refer to drawing D-108765-SA for additional information.

Section 8: Lower & Upper Back-Up Rails

The lower back-up bearing rail assembly (Figure 8.1) supports the bottom work rolls or intermediate rolls. The back-up bearing design utilizes bearings with a special profiled outer shell. The bottom rail has adjustable roll bending. As the roll bend actuators are adjusted, the bottom back-up rails pivot close to the last work roll. This ensures that the last work roll is straight and the roll bending is feathered out from entry to exit.

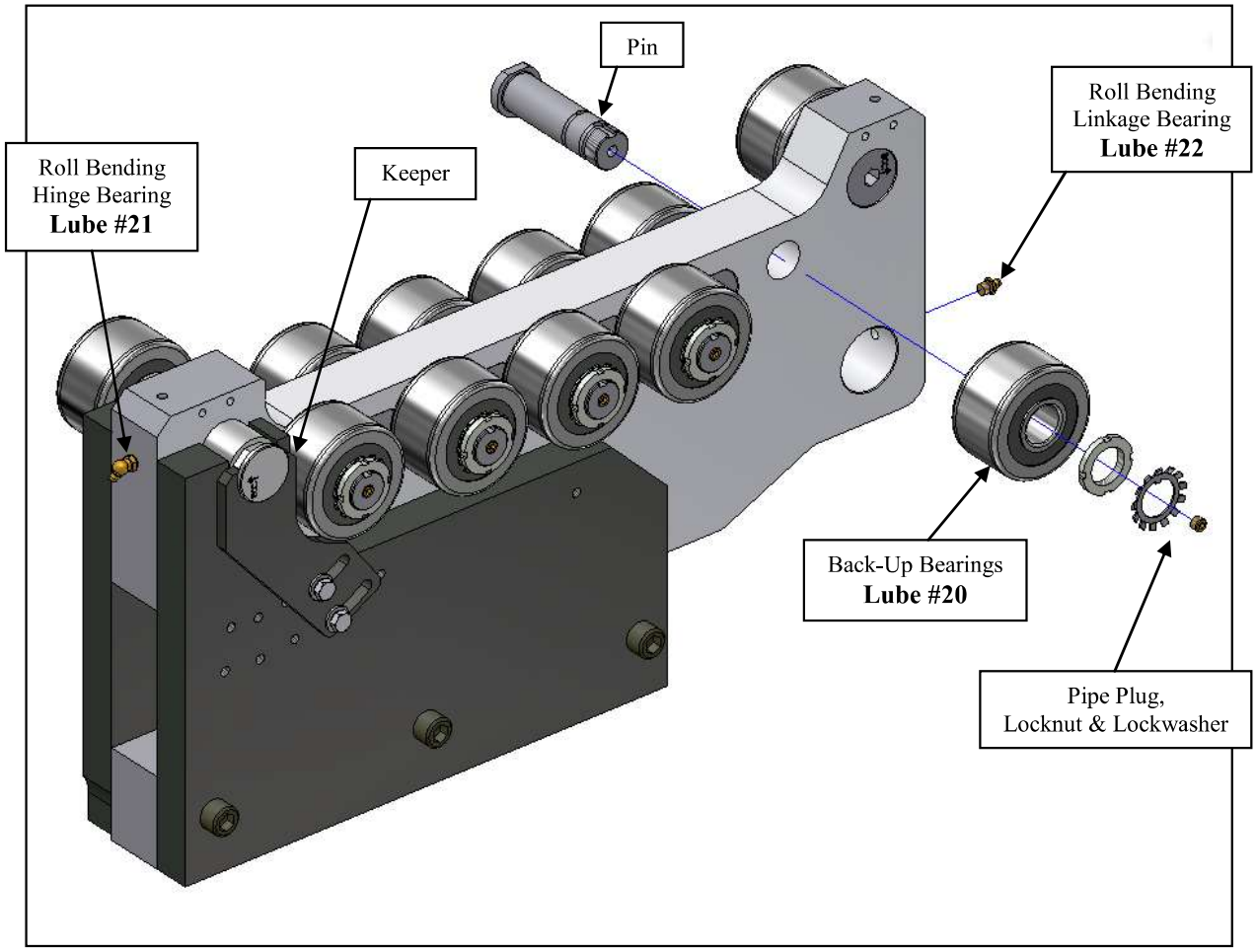


Figure 8.1 Lower Back-up Rail

The upper back-up bearing rail assembly (Figure 8.2) supports the upper work rolls (and intermediate rolls). The back-up bearing design on the upper back-up rail also utilizes bearings with a special profiled outer shell. The upper back-up rail is fixed to the upper frame assembly.

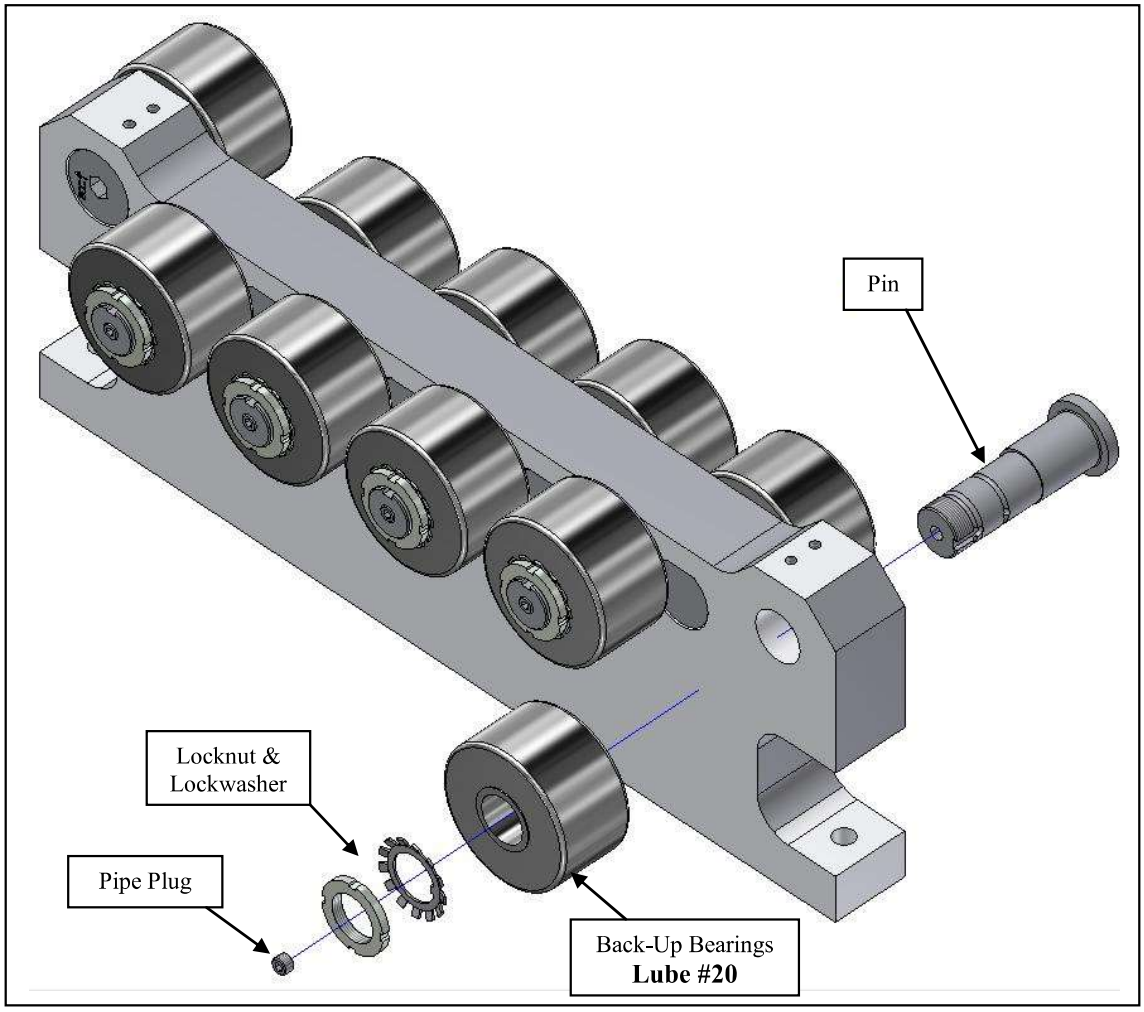


Figure 8.2 Upper Back-up Rail

Section 9: Solvent Spray System Assembly

The spray system assemblies are used to reduce scale buildup on work rolls; solvent sprays flood work rolls top and bottom. This flood of solvent will also help remove scale buildup in the leveler. Additionally, this solvent flood will also help the rolls slip on the material to counter the effect of differential roll RPM during deep entry roll penetrations.

The solvent (supplied by customer) must contain additives for anti-corrosion and lubrication, similar to additives used in cutting fluid.

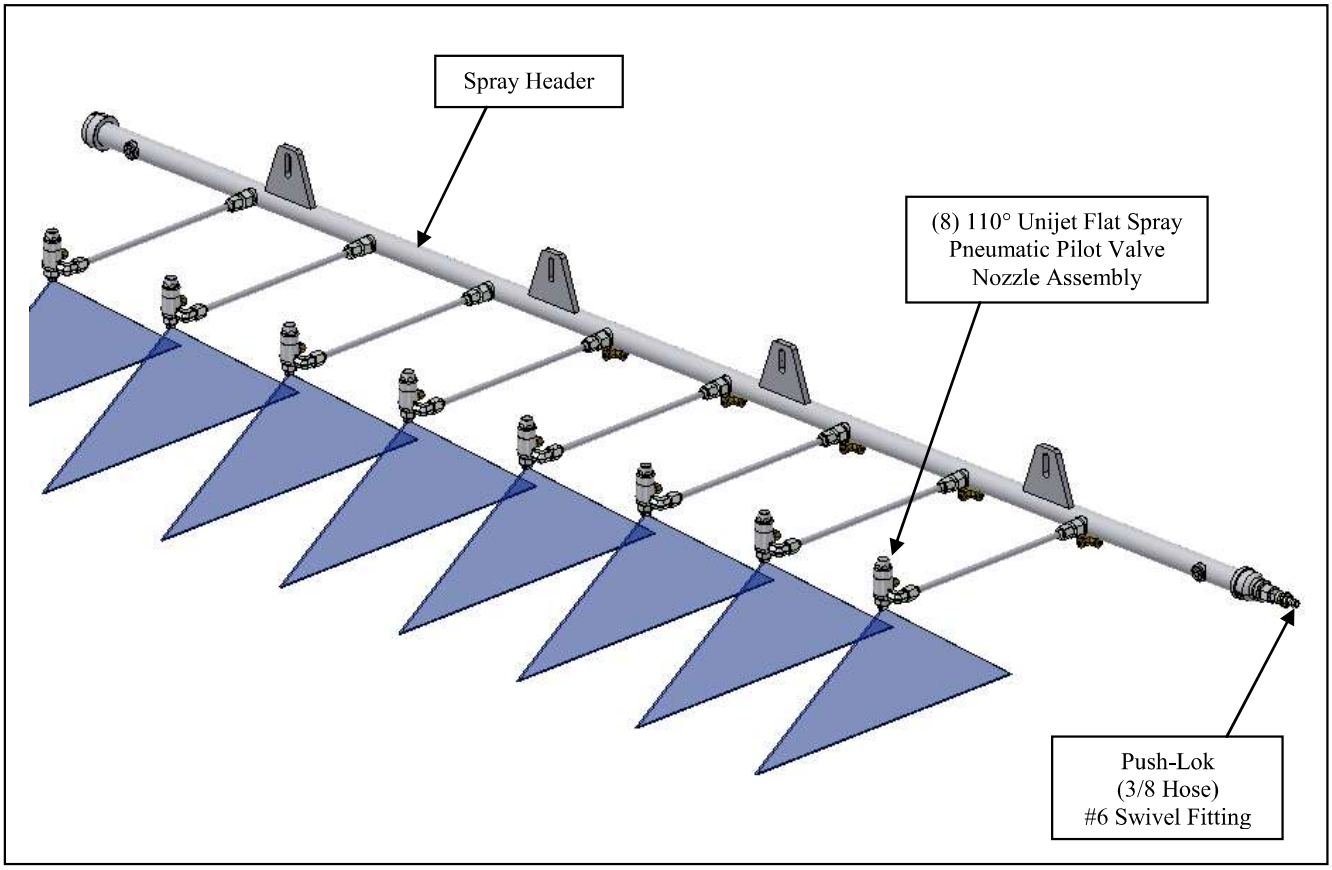


Figure 9.1. Solvent Spray System Assembly

Primary components of the solvent spray system are illustrated above in figure 9.1. Refer to drawings D-108761-SA and D-108767-SA for additional information.

Section 10: Traversing Conveyor Assembly

The 72" Belt Conveyor Assembly, attached to the lower leveler frame, is used to maintain "high temperature" line continuance while the leveler is not in use. The slider bed belt conveyor is constructed of a welded steel conveyor frame with a mild steel slider bed surface. Other components of the conveyor assembly are:

- 72.00" Wide SK51 Kevlar flat belt with treated and laced hidden clipper splice.
- 10 HP shaft mounted AC gearmotor assembly, with encoder geared in, to run at 520 Ft./Min. The encoder interfaces with customer provided controls.
- Manual belt tensioning/take up using (2) dead shaft rolls with threaded take up rods mounted in a fixed bracket. These rolls are adjusted using wrenches to turn adjusting nuts located **on both sides** of the conveyor frame (Refer to figure 9.5).
- 6.00" Dia. main drive roll with high temp. Nitrile rubber lagging. Gearmotor drive is direct coupled to the drive roll input shaft. Roll Nitrile lagging rated up to 350 degrees F.
- 4.00" Dia. dead shaft belt support rolls mounted under conveyor frame
- 4.00" Dia. dead shaft adjustable belt lift rolls installed between the slider bed plates.
- Engineered lifting points with lifting eyes.

Primary components of the 72" Belt Conveyor are illustrated below (figures 10.1 – 10.5). Refer to drawing D-109382-SA for additional information.

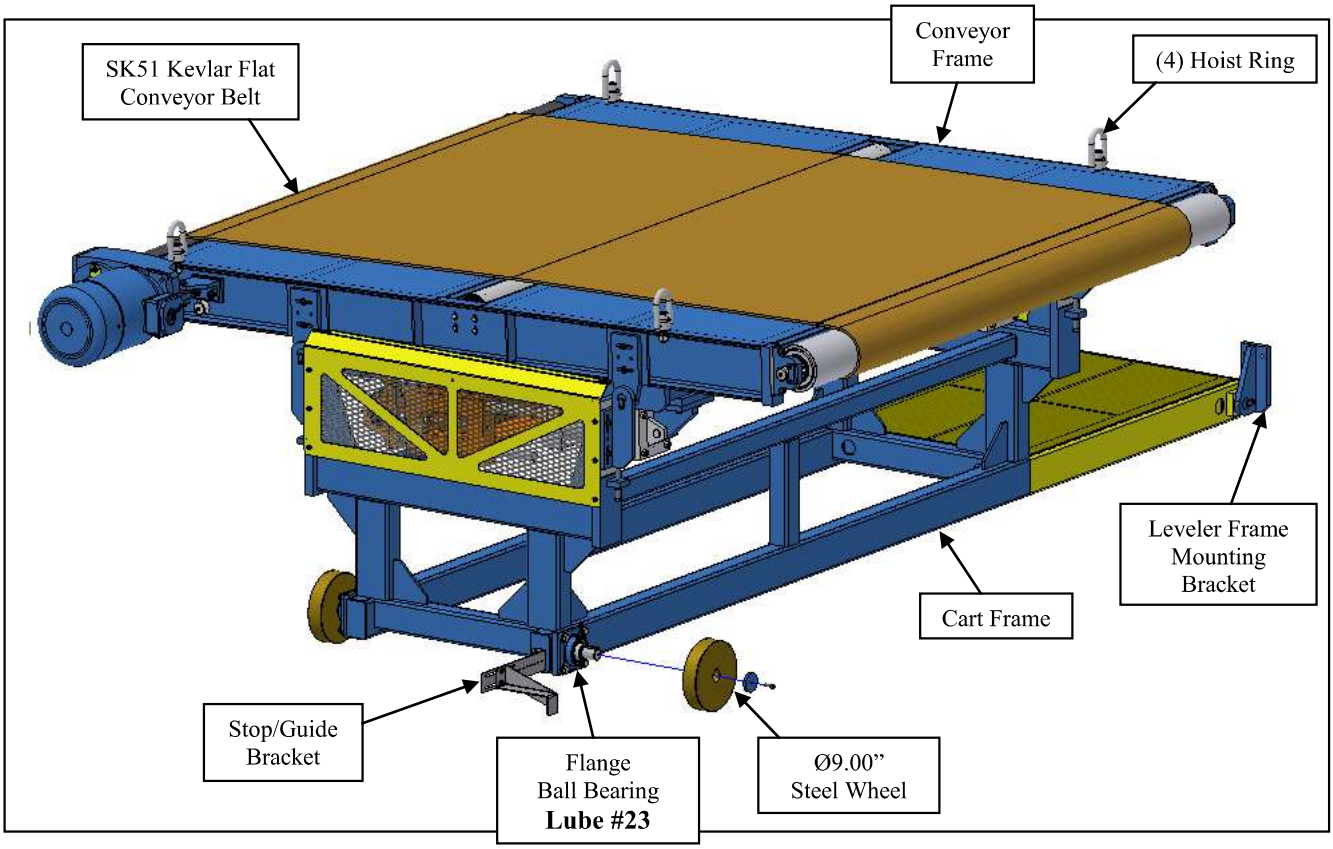


Figure 10.1 72" Conveyor Assembly

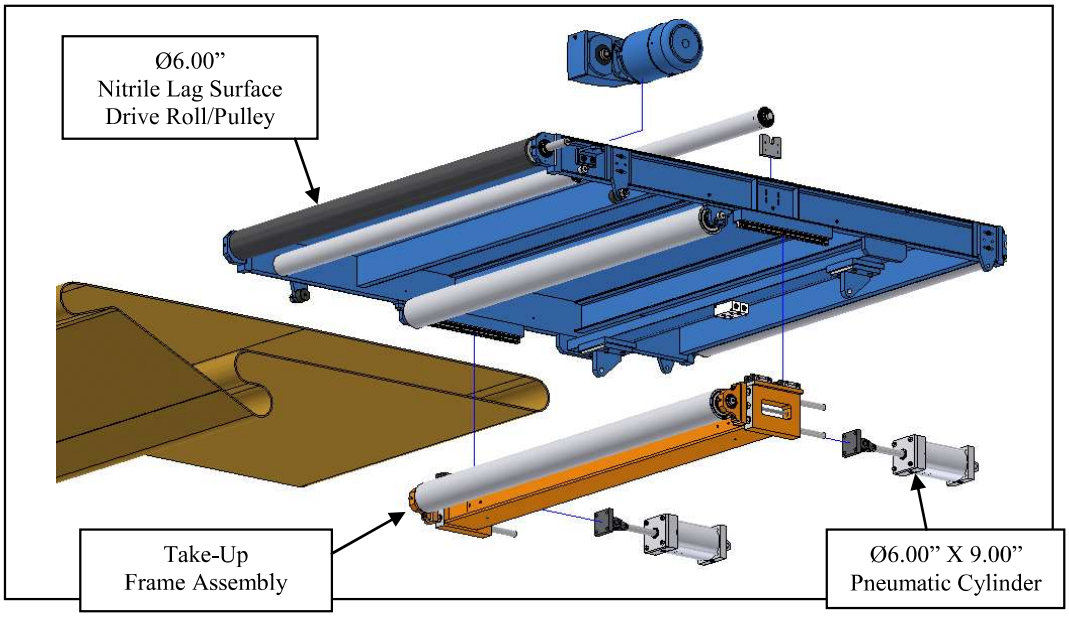


Figure 10.2 72” Conveyor Illustrations

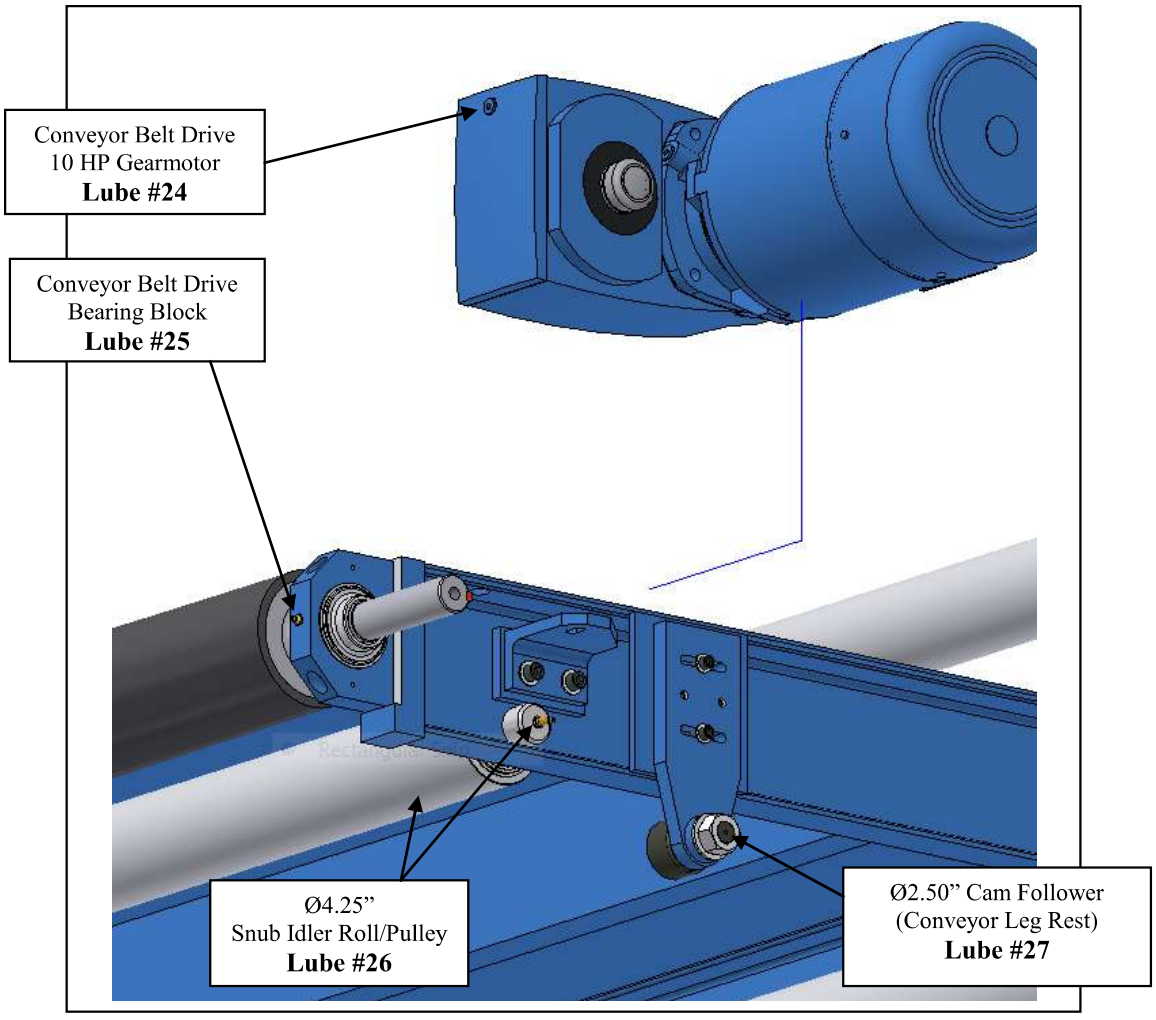


Figure 10.3 Conveyor Illustrations

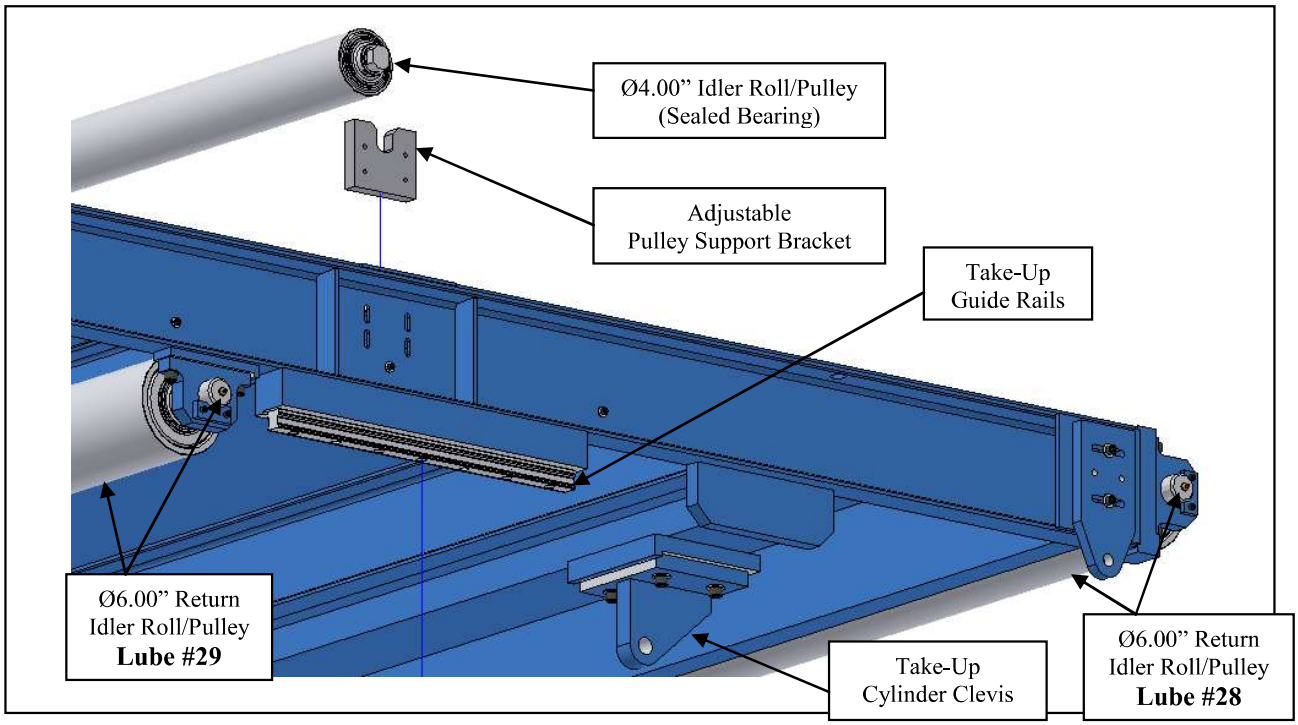


Figure 10.4 Conveyor Illustrations

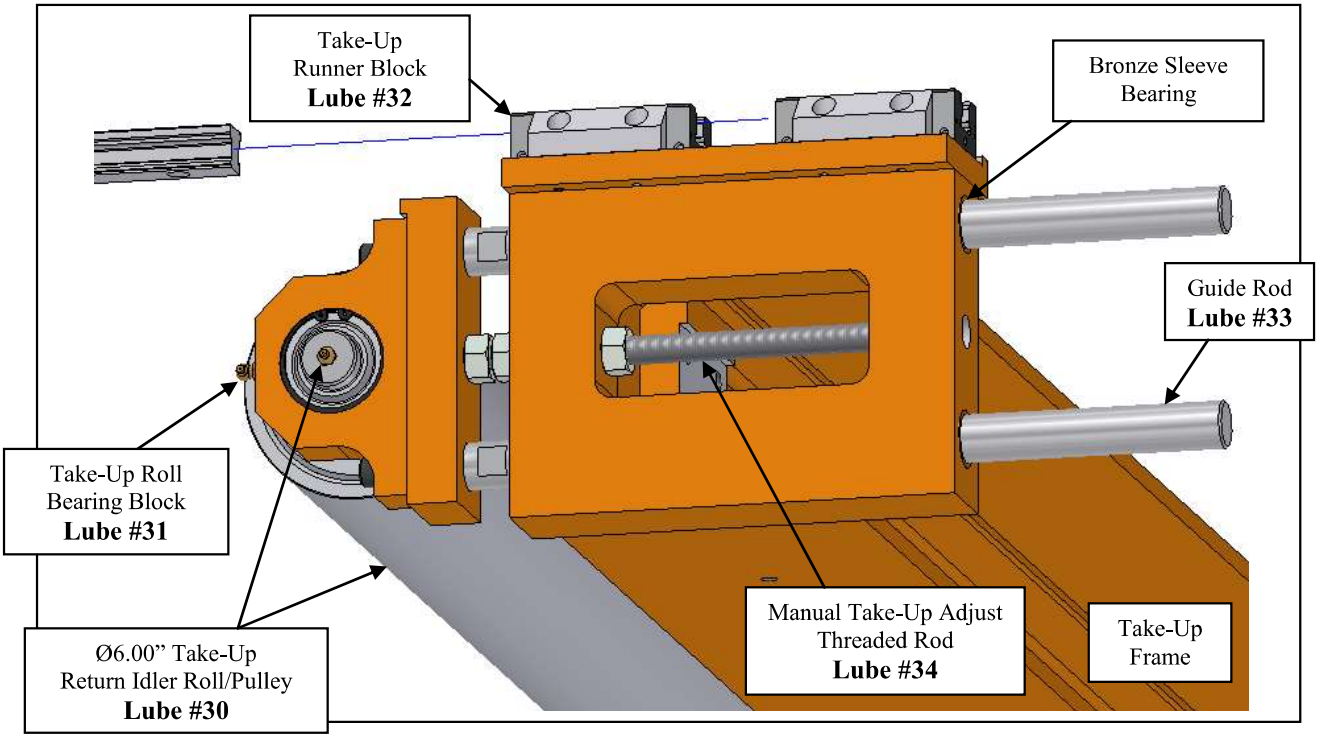


Figure 10.5 Take-Up Frame Assembly

Primary components of the Take-Up Frame Assembly are illustrated above (figure 10.5). Refer to drawing D-109383-SA for additional information.

Section 11: Docking Station

The cassette docking station is used to support the extraction and insertion of the 1.75” dia. work roll cassette assembly. While being extracted or inserted, the cassette assembly maintains slide bearing contact on bronze liners. Cam followers mating with the cassette assembly pinion rack, maintain alignment with the pinion gear drive, located on the lower leveler frame. The locking safety pin secures the traversing leveler to the fixed docking station. Reference Figure 11.1.

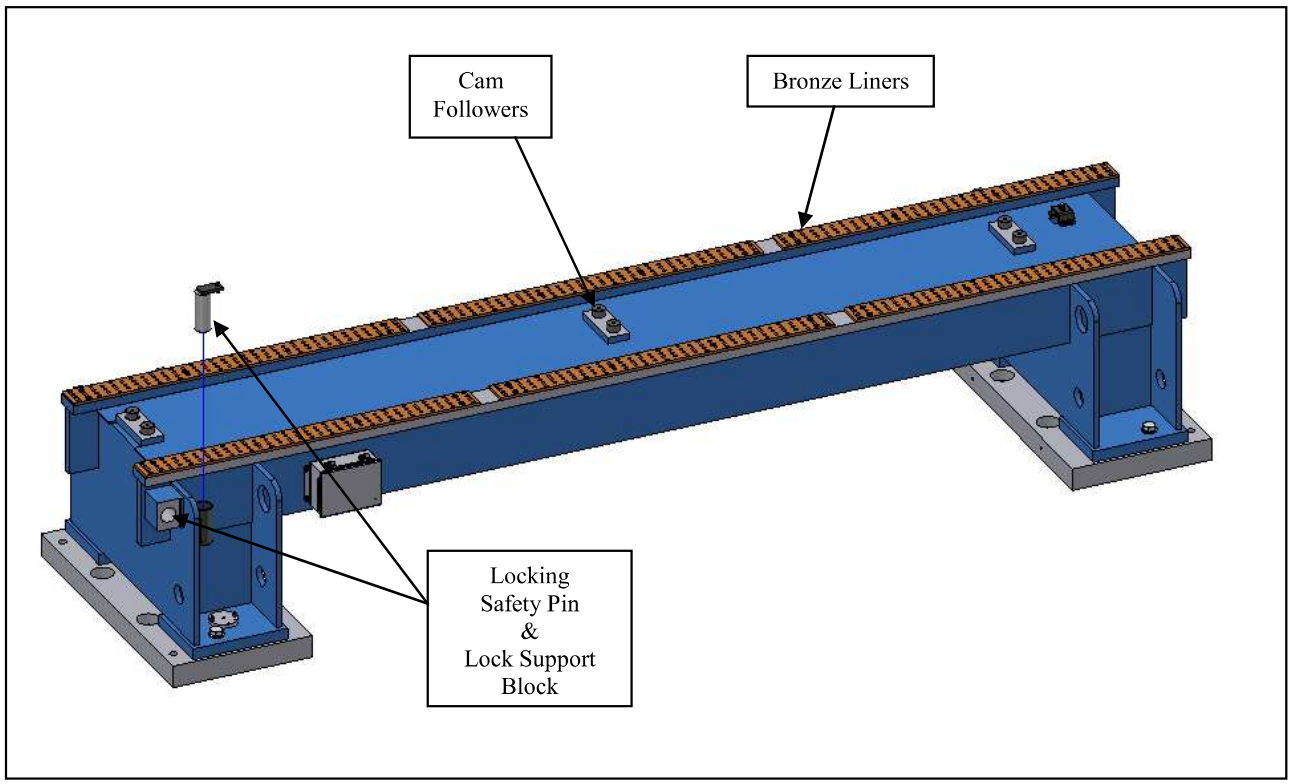


Figure 11.1 Docking Station

Section 12: Cassette Rotator

The Cassette Rotator (Figure 12.1) is a device used to rotate the upper cassette in order to make cleaning and maintenance easier for the operator. To use the rotator, first remove the cassette from the leveler. Next remove the (2) socket head bolts that are holding down the locking pads on the cassette rotator. Flip up the locking pads and remove the cassette lifting frame from the rotator with a crane. Attach the lifting frame to the upper cassette with (8) socket head bolts. Remove the upper cassette from the exchange table and place support back in the rotator. Finger tighten the locking pads down to secure the lifting frame in place. Finally the operator may rotate the cassette with the air motor control lever.

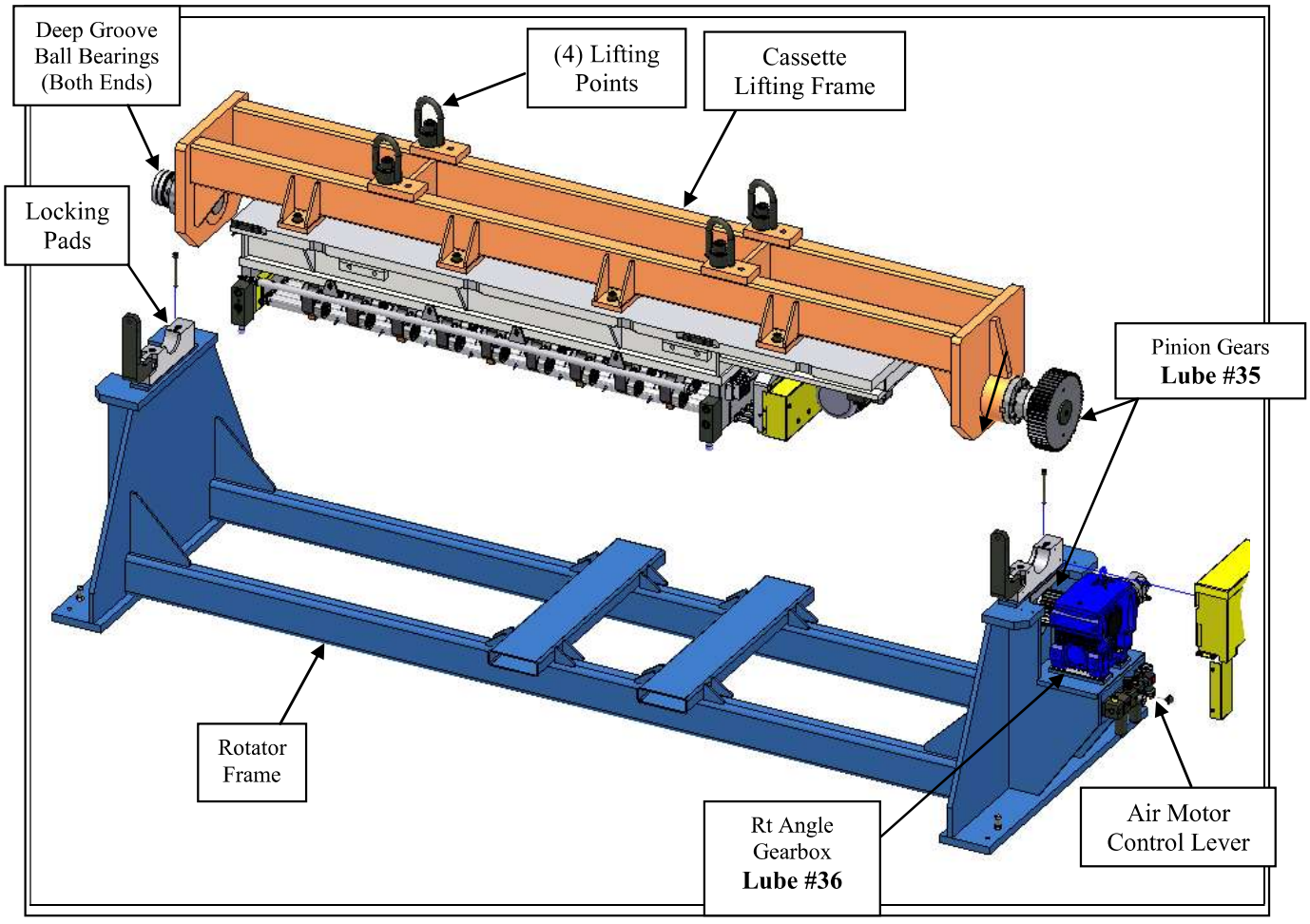


Figure 12.1 Cassette Rotator