



# union iron

## BUCKET ELEVATOR COMMERCIAL MODELS ASSEMBLY & OPERATION



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: IBEM0308-R1

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# 1. Introduction

Thank you for purchasing a Union Iron Bucket Elevator.

Union Iron Works Bucket Elevators are the most economical and efficient means of elevating grain. The initial cost is low, and required maintenance is minimal.

Dependable Union Iron Works Bucket Elevators have earned the reputation of providing greater strength, more operator convenience, and higher capacities in grain handling systems everywhere. We have combined ingenuity, integrity, and craftsmanship to make the best bucket elevator on the market.

Everyone operating or maintaining this equipment should read this manual to reduce downtime and equipment failure, and 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 Boot Assembly above the Inspection Door, and on the Head Assembly above the Inspection Door. Please mark the number below for easy reference.

<b>Model#</b>	
<b>Serial #</b>	
<b>Production Year</b>	



# 2. Safety First



The Safety Alert symbol to the left 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 to you?

Three big reasons:

- 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.

The Safety Alert symbol means ATTENTION, BE ALERT!, YOUR SAFETY IS INVOLVED.

### 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.

## 2.1. GENERAL SAFETY

**Important:** *The general safety section includes instructions that apply to all safety practices. Any instructions specific to a certain safety practice (e.g., assembly 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.*

**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.

- It is the equipment owner and the operator's responsibility to read and understand **ALL** safety instructions, safety decals, and manuals and follow them before 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. Unauthorized modification may impair the function and/or safety, and could affect the life of the equipment. Any modification to the equipment voids the warranty.
- Do not allow children, spectators, or bystanders within the work area.
- Have a first-aid kit available for use should the need arise, and know how to use it.
- Provide a fire extinguisher for use in case of an accident. Store in a highly visible place.
- Wear appropriate protective gear. This list includes, but is not limited to:
  - a hard hat
  - gloves
  - protective shoes with slip-resistant soles
  - protective goggles
  - hearing protection
- For Powered Equipment: before servicing, adjusting, or repairing powered equipment, unplug, place all controls in neutral or off position, stop the engine or motor, remove ignition key or lock out power source, and wait for all moving parts to stop.



- Follow good shop practices:
  - keep service area clean and dry
  - be sure electrical outlets and tools are properly grounded
  - use adequate light for the job at hand
  - Think SAFETY! Work SAFELY!



## 2.2. ASSEMBLY SAFETY

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- Have 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 10 cm, the grating opening must not exceed 1.27 cm x 2.54 cm (or 1.27 cm x 5 cm 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 is 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

Electrical controls, machinery guards, railings, walkways, arrangement of installation, training of personnel, etc., are necessary for a safe working environment. It is the responsibility of the contractor, installer, owner, and user to supplement the materials and services furnished with the necessary items to make the elevator installation comply with the law and accepted standards.

- Do not operate elevators unless all covers/guards are in place.
- Advise all operating personnel of the location and operation of all emergency controls and devices. Maintain clear access to these controls and devices.
- Do not place hands, feet, or any part of your body or clothing in the elevator.
- Never walk on elevator covers, gratings, or guards.
- Do not use elevator for any purpose other than that which it was intended.
- Do not poke or prod material into the elevator with a bar or stick inserted through the openings.
- Elevators are not normally manufactured or designed to handle materials that are hazardous to personnel (explosive, flammable, toxic, or otherwise dangerous). However, elevators may be designed to handle these materials. Also, elevators are not manufactured to comply with local, state, or federal codes for unfired pressure vessels. If hazardous material is to be conveyed or if the elevator is to be subjected to internal or external pressure, consult Union Iron Works prior to any modifications.
- Be aware of hazardous locations where, without protection, people may be injured by contact with elevator or material.
- Handling foodstuff subjects elevators to special codes for construction, location, and accessibility. Investigate before ordering standard components! Food elevators often require hinged access doors for drop-bottom trough cleaning, and such doors require special safety controls and procedures by customer to prevent personnel injuries. Extensive use of padlocks, with keys in the hands of only management personnel, is one means frequently used.
- Do not attempt a field modification of elevator or components.
- Perform frequent inspections of these controls and devices, covers, guards, and equipment to ensure proper working order and correct positioning.

The Conveyor Equipment Manufacturer's Association (CEMA) has produced an audiovisual presentation entitled "Safe Operation of Screw Conveyors, Drag Conveyors, and Bucket Elevators." Union Iron Works encourages acquisition and use of this source of safety information.

<b>WARNING</b>	
	<p>Explosion release hazard!</p> <p>To prevent serious injury or death, stay a safe distance from explosion release vents during operation.</p>

## 2.3.1. LOCKOUT AND TAGOUT PROCEDURES

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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 all OSHA 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, see [www.osha.gov](http://www.osha.gov).

## 2.4. SAFETY DECAL LOCATIONS

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- 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.
- Safety decals are available from your distributor, dealer, or factory.

### 2.4.1. DECAL INSTALLATION

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1. Decal area must be clean and dry, with a temperature above 10°C (50°F).
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.

### 2.4.2. DECAL LOCATIONS

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Replicas of the safety decals that are attached to the equipment are shown in the figure(s) that follow. Good safety requires 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 decal 1 (General Equipment Warning) in a convenient location on the equipment.
- Place decal 2 (Amputation Hazard) on all inspection and access doors.
- Place decal 3 (Explosion Hazard) on all explosion vents.
- Place decal 4 (Rotating Parts Hazard) on and behind the belt or chain guard.
- Place decal 5 in a convenient location on the equipment.
- Place decal 6 (Electrocution Hazard) on the motor conduit boxes.
- Place decal 7 (Crush Hazard) on the head assembly.
- Place decal 8 (Fall Hazard) on the head assembly

# 3. Installation

**Warning:** Before continuing, please reread the safety information relevant to this section in the safety section of this manual. Failure to follow the safety instructions can result in serious injury, death, or property damage.

## 3.1. PRE-INSTALLATION

Prior to installing, a **licensed structural or civil engineer** must be consulted for the design, construction, and supervision of the complete installation including the foundation and guy wires. A qualified contractor or millwright must be used to erect the elevator and accompanying equipment and structures.

The best Bucket Elevator improperly installed cannot be expected to offer the performance intended by Union Iron Works. A good installation should be the primary concern. UIW cannot be responsible for the assembly of a Bucket Elevator. The suggestions and information contained within this manual are offered solely as a convenience as we can assume no liability for installation, either expressed or implied. The following must be adhered to when erecting the elevator:

1. Unless the location of the Bucket Elevator has been pre-determined by a layout drawing, careful consideration should be given to the depth of boot pit, side of boot to be fed, direction of discharge at head, possible overhead obstructions, etc.
2. Plan ahead for the location of guy wire anchoring points (deadmen) on the ground and on nearby structures. Bucket elevators will stand vertically but must be supported with with guy wires to protect against wind loads
3. Provide sufficient clearance for guying, anchoring, and bracing. When the elevator is to be fed from a feeder or conveyor, allow for proper clearances for drives, discharges, and valves. Enough clearance should be provided to allow proper maintenance of the equipment after it has been installed. Thought given to such matters prior to installation can prevent later problems in the flow plan and avoid possible bottlenecks.

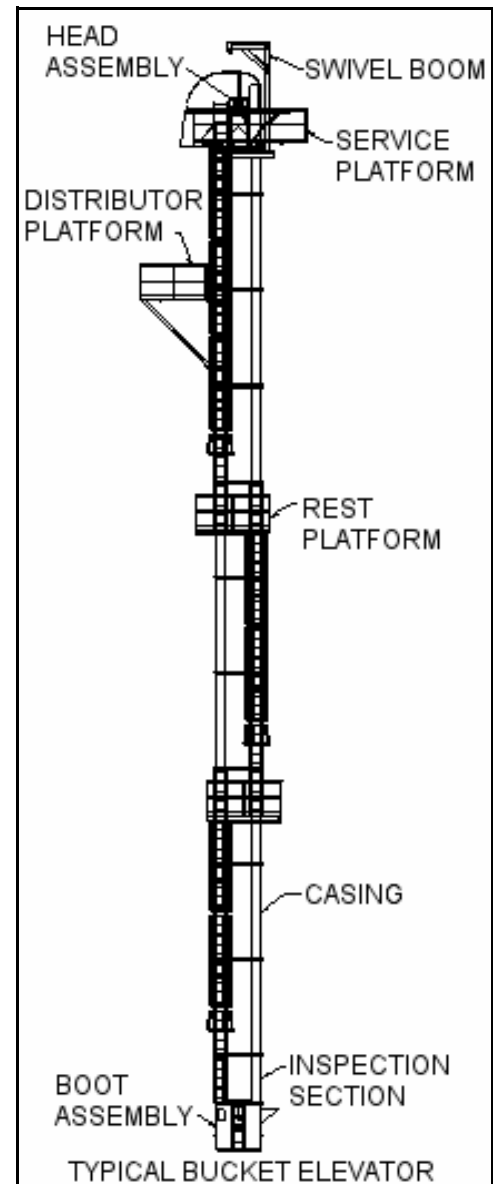


Figure 3.1

4. The foundation for the bucket elevator must give consideration to live loads, dead loads, wind loads, and soil bearing loads as well as proper moisture runoff on the top of the base.
5. Other support structures must be provided for other equipment as the bucket elevator will not support equipment such as distributors, cleaners, spouting, etc.

Refer to Figure 3.1 at right for additional general assembly layout.

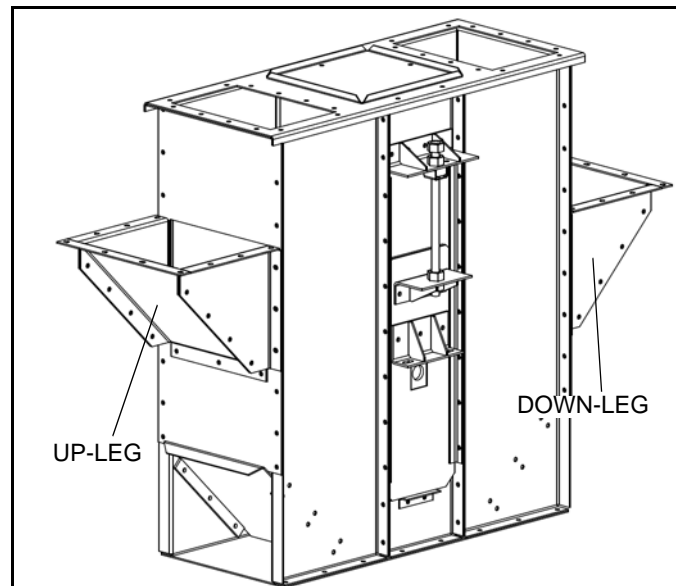
## 3.2. CHECK SHIPMENT

Immediately check that all items in the shipment have been received and are undamaged (check for bent or dented casing sections, and look over the covers, buckets, chain guards, drives, etc.).

**Note:** *Mark claims for damaged parts on the shipping papers and immediately file a claim. Do not attempt to install a damaged item.*

## 3.3. SETTING THE BOOT

1. Set boot of the bucket elevator on a firm and level foundation. A boot that is not level makes it very difficult to plumb the elevator. It may be necessary to shim under the base to properly level the boot.
2. After the boot is located and leveled, anchor it to prevent shifting. Bolts, set in concrete, and plates, overlapping the base flange, are recommended for anchoring.



**Figure 3.2**

3. Mount the inlet hopper(s) on the up-side or down-side of the boot, or on both sides, if required. Standard size hoppers can be mounted on either side of the boot. It is always best to locate the bottom of the inlet hopper no lower than the center of the boot pulley. Elevator capacity may be reduced if the inlet hopper is located improperly.

**Note:** *Most free-flowing materials, including whole grains, feed best into the boot on the up-leg side. Feeds for light materials that tend to dust feed best on the down-leg side for better filling of the buckets.*

## 3.4. BUCKET ELEVATOR SUPPORT

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**Important:** *Figure 3.3 gives recommendations only. Be cautious with individual installations to ensure proper guying. No liability is assumed by UIW. Consult your local engineer for your specific guying needs.*

1. Bucket Elevators are self-supporting but not freestanding. Support elevators laterally at least every 9.14 m. When the elevator is installed next to adjacent structures, adjustable braces between the elevator and the structure may be used. If there are no adjacent structures to support the elevator, locate and install guy cable anchors.
2. Make anchors from structural beams, railroad rails, pipe, or other heavy material embedded in concrete to a depth that will ensure their rigidity and strength. Extend anchor beams approximately 4.27 m above ground, or to a height that will ensure adequate clearance for trucks and tractors to pass under guy cables.

### NOTICE

Collision of a vehicle with a guy cable can cause extensive damage to a Bucket Elevator.

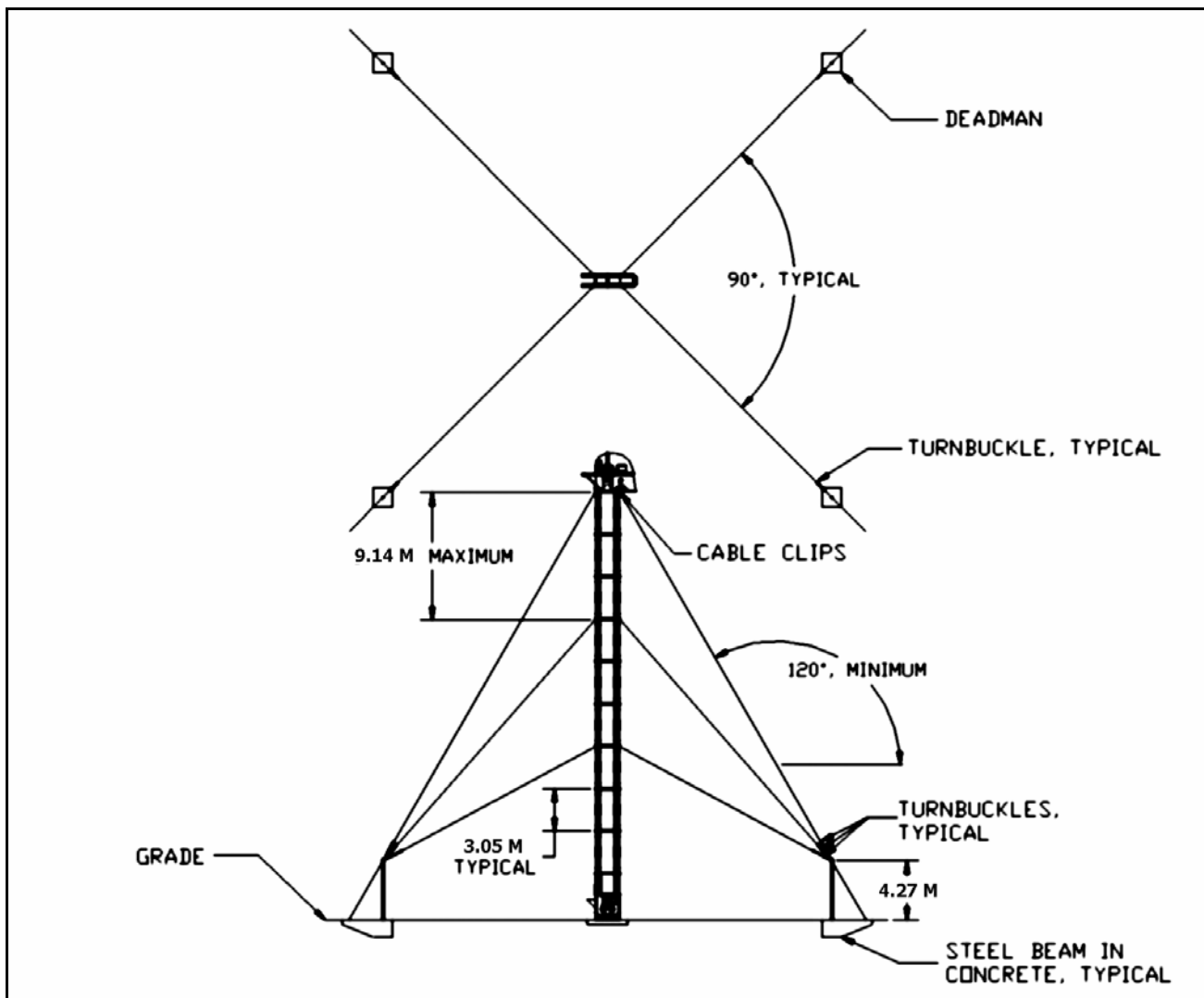


Figure 3.3 Typical Anchor & Guy Cable Arrangement and Location

## 3.5. ELEVATOR CASING

The most popular and recommended means of assembly is by crane. With a crane, most of the assembly is done on the ground. Two methods of assembly for the Bucket Elevator are described below. They differ only in the manner of assembling and erecting the casing.

### 3.5.1. METHOD 1 - ASSEMBLE ON GROUND, LIFT BY CRANE

1. Set boot. See "Setting The Boot" on page 14.
2. Erect casing and assemble one piece at a time (most work is performed on or near the ground).
3. Install eyebolts or lifting lugs in the bearing/motor support frame of the head section. Make certain that the bolts or lifting lugs are strong enough to support the head, drive, platforms, ladder, safety cage, and the entire casing. Use cables or chains to attach a crane cable to the eyebolts.

- Carefully lift the assembly to an upright, vertical position.

### NOTICE

When lifting elevator casing to an upright position, 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.

**Important:** *When lifting any assembly of Bucket Elevator parts (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.*

- Lift the assembly to a height sufficient to allow a single section of casing to be positioned under it and bolted in place. Do not forget to caulk all flanges.
- Assemble ladders, safety cages, and guy brackets, with cables attached, as required. **(jerry emailed drawings, will need to add and elaborate)**
- Continue lifting and adding casings until all sections are properly installed.

**Note:** *Be sure to properly locate the inspection section as shown in the assembly drawing in Figure 3.1.*

- Lift and position the complete head and casing assembly onto the boot. Align mounting holes and bolt together securely.
- Plumb the Bucket Elevator assembly in accordance with the instructions in the next section—"Plumbing" on page 18.

## 3.5.2. METHOD 2 - ASSEMBLE SECTIONS VERTICALLY LIFTING BY CRANE

- Set boot. See "Setting The Boot" on page 14.
- Assemble 9.14 m or 12.19 m of casing on the ground and then lift equipment into an erect position. (This method requires more aerial work.)
- Assemble the head, platforms, etc. the same as with Method 1.
- Assemble all casing on the ground in assembled sections of 9.14 m to 12.19 m.
- Attach ladder and safety cage sections, platforms, and guy brackets, with cables installed, as required.

**Important:** *Do not assemble casing in a "flat" position. Always assemble and lift so that the weight is supported through its narrow, stronger section, not its wider "flat" section. **Pictures needed to illustrate, from Peter.***

- Attach a crane to the top end of the first section assembly and lift it into position onto the boot.

### NOTICE

When lifting elevator casing to an upright position, 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.

7. Install casing to boot flange bolts and tighten.
8. Attach guy cables and/or braces and secure.
9. Lift and install remaining assembled sections of casing.

**Note:** *Be sure to properly locate the inspection door as shown in the assembly drawn in Figure 3.1.*

10. Install eyebolts or lifting lugs on the bearing/motor support frame of the head section and lift the head assembly into position on top of the casing and secure the flange bolts.
11. Check all guy cables to be sure they are secure and tight.

### NOTICE

If a cleaner or any other piece of heavy equipment is added, it must be supported from the ground.

Additional unsupported weight could damage casing and impair the operation of the Bucket Elevator.

## 3.6. PLUMBING

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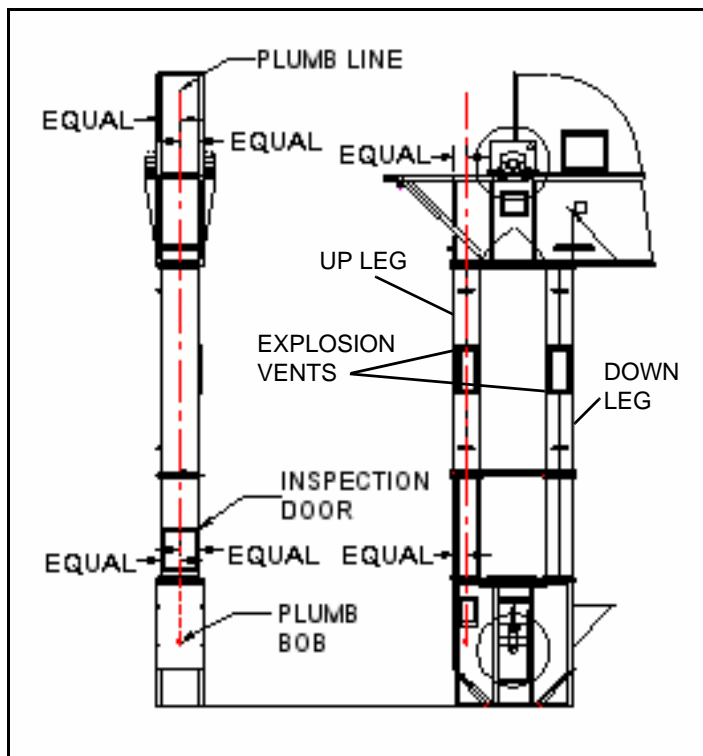
Leave the crane attached and plumb the Bucket Elevator by either of the two methods described below.

**Note:** *Be sure turnbuckles are installed in all cables and located so that they may be easily reached for tightening.*

### PLUMB LINE:

See Figure 3.4.

1. Remove the head cap and drop a plumb line inside the up-leg casing to the boot. Do not allow the line weight to touch the bottom of the boot.
2. Suspend the plumb line on a piece of wood or metal (that cannot roll) placed across the top of the head housing.
3. Adjust guy cables as required so that the Bucket Elevator is plumb from side-to-side, as well as from front-to-rear.
4. Measurement from the plumb line to side and end of casing housing at the inspection door must be the same measurement taken at the top of the leg. Make all adjustments and then anchor connections before removing the plumb line so that a final check may be made.



**Figure 3.4**

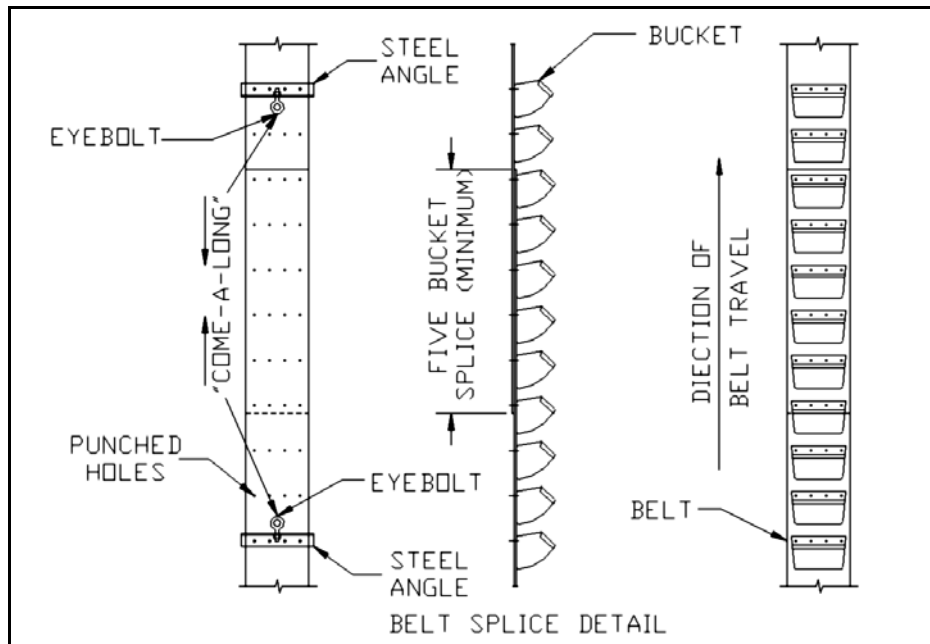
### **TRANSIT**

1. If a transit is used, plumb from side-to-side and from front-to-rear.
2. Take as many sightings as necessary (90° apart) to plumb the bucket elevator.
3. Check sightings once more after securing all guy cables.

## **3.7. BELT AND BUCKET INSTALLATION**

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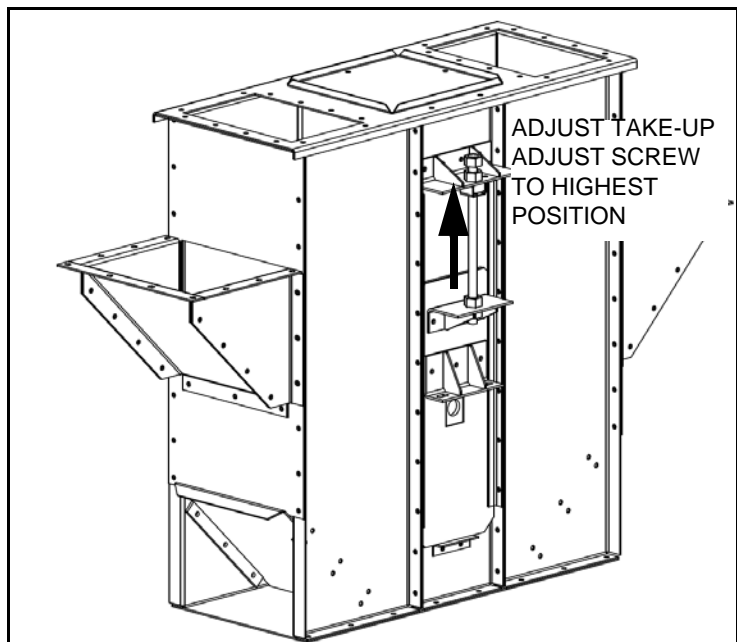
The belt can be installed with or without the buckets attached depending on the size of the Bucket Elevator and the equipment available. Regardless of the method used, the belt is threaded in the same manner.



**Figure 3.5** Belt Splice

To install the belt, proceed as follows:

1. Using the take-up adjustment screws, raise the boot pulley to its highest take-up position. Remove the head cover cap and drop a strong rope or cable down the up-leg casing until the end can be removed through the boot hopper opening or the service door in the casing.
2. 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 steps that follow. See also Figure 3.5.

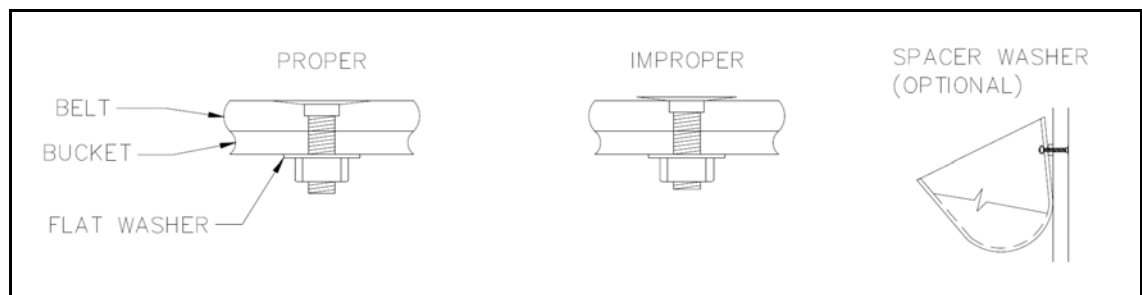


**Figure 3.6**

**Note:** *Fabricate two steel angle iron pieces.*

- a. Cut the steel angle the same length as the belt width.
- b. Drill holes in one side of steel angle to match the bucket attaching holes in the belt.
- c. Drill a single hole in the center of the other side of the steel angle for mounting an eyebolt.

3. Install the eyebolt, attach the angle to the end of the belt, and attach the rope or cable.
4. Use a rope or cable to pull the belt to the head pulley.
5. Secure the end of the belt in this position and drop the end of the rope or cable down the down-leg casing. Use the hopper opening or cleanout door to thread the rope or cable around the boot pulley and bring it out the hopper or service door opening.
6. Use the rope or cable to thread the belt over the head pulley and down the down-leg casing and around the boot pulley.
7. Splice the belt by using the lap method. The lead end of the belt (direction of travel), as it is brought up from the boot pulley, must overlap the trailing end of the belt.
8. Using the second steel angle, attach it angle to the belt and use a come-a-long to pull the 2 ends of the belt until the slack is taken up and the bucket attaching holes in the belt are aligned. Bucket attaching holes, which are already punched, are used for bolting the belt end together. Longer bucket bolts are used for splicing. These bolts also secure buckets on the spliced portion of the belt. The length of the overlap at the splice must cover 5 buckets. If possible, allow the belt to hang and stretch for 24 hours.
9. Pull the leading edge of the belt over the trailing end until slack at the boot pulley is removed and bolt holes are aligned.
10. Insert the bucket bolts from the **back** side of the belt. See Figure 3.7. Mount the buckets on the front side and secure with nuts. Tighten the nuts sufficiently to set the head of the bolt in the belt. Tighten bolts with a speed wrench, or, if an impact wrench is used, exercise care to prevent tightening to the point of fracturing the bolt.

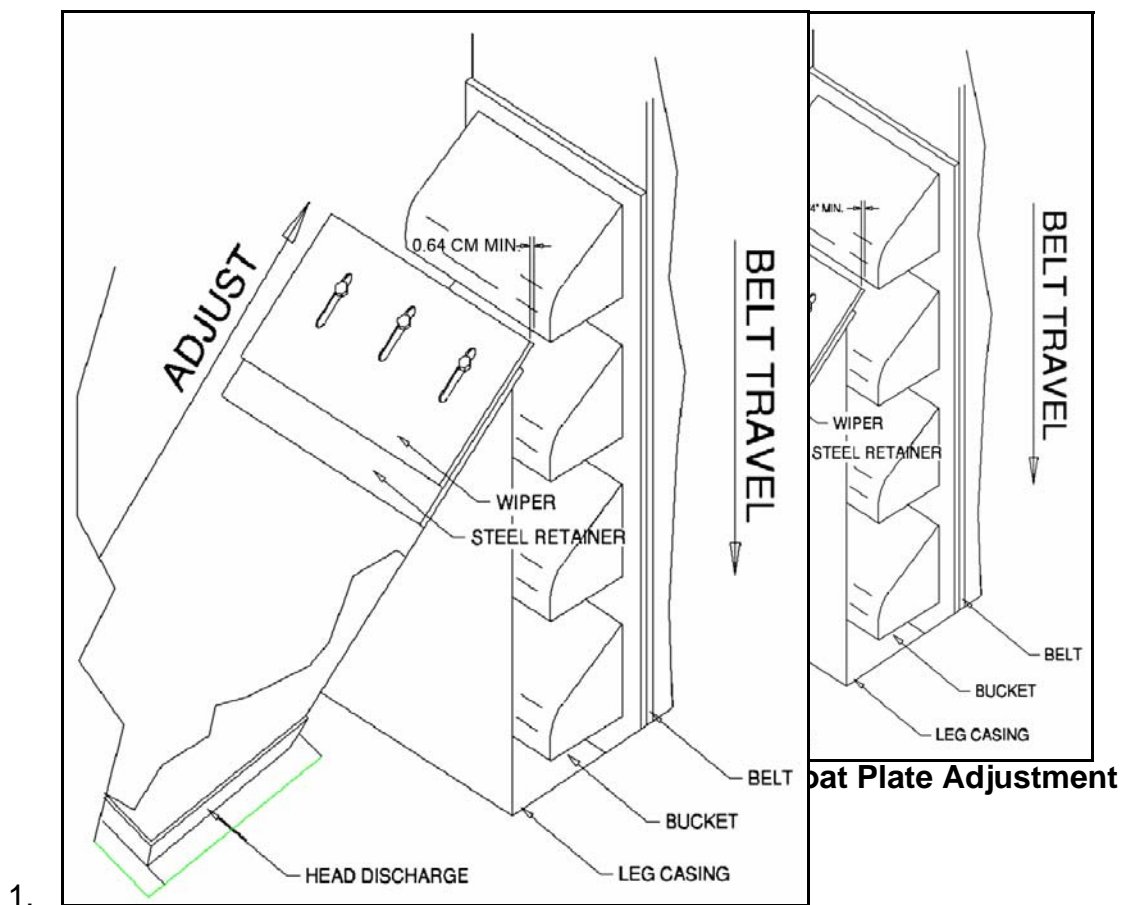


**Figure 3.7**

11. At this point, the belt has been securely spliced and 5 or more buckets have been installed in the splicing process. The remaining buckets should not be attached at consecutive mounting holes in order to keep each leg of the belt more in balance and to make moving it easier. Attach one bucket at 8–20 row intervals for the first complete belt revolution. On the second revolution, cut the interval spacing in half.
12. Repeat this process on each revolution until all buckets are attached. This procedure will help balance the weight load during bucket installation, particularly on taller Bucket Elevators.

**Important:** *Check and retighten all bucket bolts after first week of operation.*

### 3.8. ADJUST THROAT PLATE WIPER



1. Before replacing the head cover cap, check the adjustment of the rubber throat plate wiper in the head section. The wiper provides a flexible extension between the throat plate and the lip of the buckets.
2. Adjust the wiper to provide a minimum clearance of .32 cm to .64 cm between the wiper and the bucket lip.

### 3.9. CHECK LEVEL OF HEAD SHAFT

It is possible that the level condition of the head shaft could have been altered during shipping, handling, and installation.

Confirm the head shaft is level. If not level, install shims under the pillow block bearing on the low side.

#### NOTICE

If the head shaft is not level, it will not track properly and could wear a hole in the side of the head, legging or boot.

### 3.10. INSTALLATION FOR TORQUE-ARM II SPEED REDUCER

1. Use lifting bracket to lift reducer.
2. Install the magnetic drain plug in the hole closest to the bottom of the reducer. Throw away the tape that covers the filter/ventilation plug in shipment and install plug in topmost hole. Of the 2 remaining plugs on the sides of the reducer, the lowest one is the minimum oil level plug.

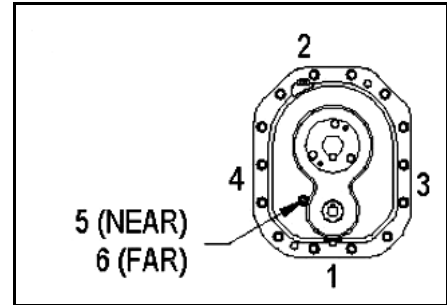



Figure 3.9 Mounting Position

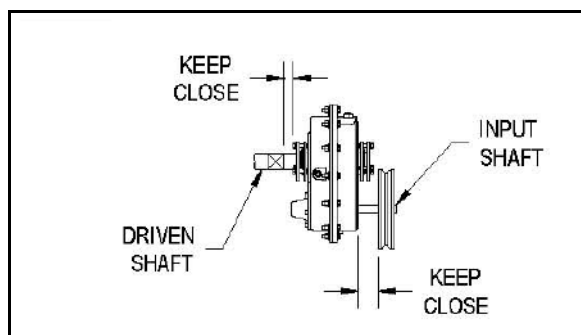
Table 3.1

Vent and Plug Locations					
1	2	3	4	5	6
Drain	Vent	Level	Plug	Plug	Plug

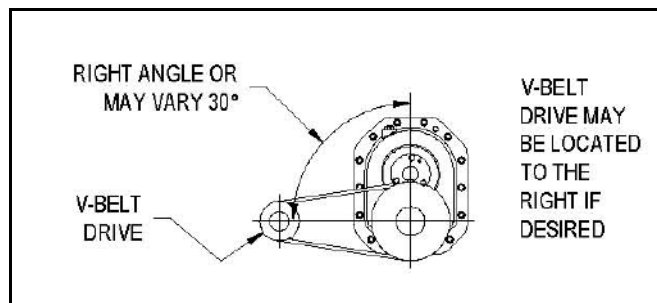
3. Mount reducer on driven shaft as follows: For Taper Bushed Reducer: Mount reducer on driven shaft per instruction in Torque-Arm II Bushing Installation section of this manual.
4. Install sheave on input shaft as close to reducer as practical. (See Figure 3.10)
5. If not using a Dodge Torque-Arm II motor mount, install motor and V-belt drive so belt will approximately be at right angles to the centerline between driven and input shaft. (See Figure 3.11) This will permit tightening the V-belt with the torque arm.
6. Install torque arm and adapter plates reusing the reducer bolts. The adapter plates will fit in any position around the input end reducer.
7. Install torque arm on reducer and equipment using hardware provided. (See Figure 3.11 & 3.12) Make sure that there is sufficient take-up in the turnbuckle for belt tension adjustment when using V-belt drive.

<b>CAUTION</b>	
	<p>Unit is shipped without oil. Add proper amount of recommended lubricant before operating. Failure to observe this precautions could result in damage or destruction of the equipment.</p>

8. Fill gear reducer with recommended lubricant. See Table 3.2



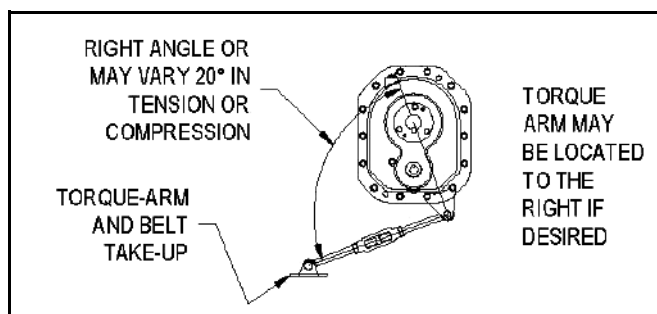
**Figure 3.10 Reducer and Sheave Installation**



**Figure 3.11 Angle of V-Drive**


**Replace Fig 2.3 and 2.4 with new images**

**Jerry Sending**



**Figure 3.12 Angle of Torque-Arm**

### 3.10.1. TORQUE-ARM II BUSHING INSTALLATION

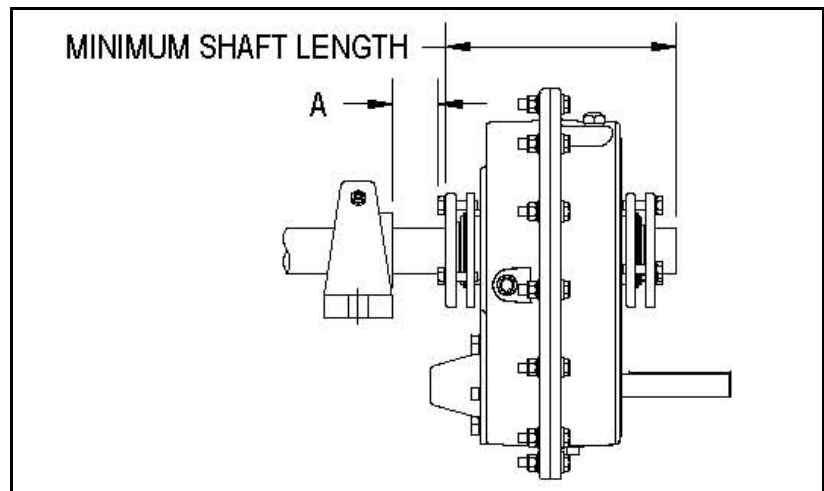
<b>WARNING</b>	
	To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Remove all external loads from drive before removing or servicing drive or accessories. Failure to observe these precautions could result in bodily injury.

#### **STANDARD TAPER BUSHINGS:**

1. One bushing assembly is required to mount the reducer on the driven shaft. An assembly consists of two tapered bushings, bushing screws and washers,

- two bushing backup plates and retaining rings, and necessary shaft key or keys. The driven shaft must extend through the full length of the reducer.
2. Install one bushing backup plate on the end of the hub and secure with the supplied retaining ring. Repeat procedure for other side.
3. Place one bushing, flange end first, onto the driven shaft and position per dimension "A", as shown in Table 1. This will allow the bolts to be threaded into the bushing for future bushing and reducer removal.
4. Insert the output key in the shaft and bushing. For ease of installation, rotate the driven shaft so that the shaft keyseat is at the top position.
5. Mount the reducer on the driven shaft and align the shaft key with the reducer hub keyway. Maintain the recommended minimum distance "A" from the shaft bearing.
6. Insert the screws, with washers installed, in the unthreaded holes in the bushing flange and align with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing screws. Tighten the screws lightly.

7. Place the second tapered bushing in position on the shaft and align the bushing keyway with the shaft key. Align the unthreaded holes in the bushing with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to



**Figure 3.13 Minimum Recommended Dimensions**

- align with the bushing holes. Insert bushing screws, with washers installed in the unthreaded holes in the bushing. Tighten screws lightly.
8. Alternately and evenly tighten the screws in the bushing nearest the equipment to the recommended torque given in Table 3.2. Repeat procedure on outer bushing.

### **SHORT SHAFT BUSHING**

1. The long bushing is designed to be installed from the side of the reducer opposite the driven equipment as shown in Figure 3.13. The long bushing when properly installed is designed to capture the end of the shaft that does not extend through the reducer. Normally the reducer would be mounted such that the input shaft extends from the side of the reducer opposite the driven equipment however the reducer design allows installation of the reducer to be mounted in the opposite direction.
2. Install the tapered bushing wedge into the hollow bore of the reducer from the same side as the long bushing will be installed. When installing the tapered

**Table 3.2**

<b>Bushing Screw Information and Minimum Clearance for Removal</b>			
<b>Reducer Size</b>	<b>Fastener Size</b>	<b>Torque in Ft. Lbs.</b>	<b>A</b>
TA0107L	5/16-18	20-17	1.08
TA1107H	5/16-18	20-17	1.20
TA2115H	3/8-16	20-17	1.20
TA3203H	3/8-16	20-17	1.20
TA4207H	3/8-16	26-23	1.48
TA5215H	1/2-13	77-67	1.81
TA6307H	1/2-13	77-67	1.81
TA7315H	1/2-13	77-67	2.06

bushing wedge into the reducer hub, install the flange end first so that the thin taper is pointing outwards towards the long bushing as shown in Figure 3.13. The wedge is properly installed when it snaps into place in the reducer hub.

3. Align the tapered bushing wedge keyway with the reducer hub keyway. The keyway in the wedge is slightly wider than the keyway in the reducer hub allowing for easier installation.
4. Install one bushing backup plate on the end of the hub and secure with the supplied retaining ring. Repeat procedure for other side.
5. Install the short bushing; flange first, on the driven shaft and position per dimension “A”, as shown in Table 3.2. This will allow the bolts to be threaded into the bushing for future bushing and reducer removal.
6. Insert the output key in the shaft and bushing. For easy of installation, rotate the driven shaft so that the shaft keyseat is at the top position.
7. Mount the reducer on the driven shaft and align the shaft key with the reducer hub keyway. Maintain the recommended minimum distance “A” from the shaft bearing.
8. Insert the screws, with washers installed, in the unthreaded holes in the bushing flange and align with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing screws. Tighten the screws lightly.
9. Place the long bushing in position on the shaft and align the bushing keyway with the shaft key. Use care to locate the long bushing with the tapered bushing wedge installed earlier. Align the unthreaded holes in the bushing with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing holes. Insert bushing screws, with washers installed in the unthreaded holes in the bushing. Tighten screws lightly.
10. Alternately and evening tighten the screws in the bushing nearest the equipment to the recommended torque given in Table 3.2. Repeat procedure on outer bushing.

# 4. Operation

**Warning:** Before continuing, please reread the safety information relevant to this section in the safety section of this manual. Failure to follow the safety instructions can result in serious injury, death, or property damage.

**Important:** *Do not operate Bucket Elevator unless the housing completely encloses the moving elements and power transmission guards are in place.*

## 4.1. PRE-OPERATION

---

Before operating the Bucket Elevator, perform the following checks and inspections:

1. **Plumb:** Make certain the Bucket Elevator is plumb.
2. **Guying/Bracing:** Be sure all guy cables and/or braces are fastened securely and have tension.
3. **Hardware:** Check that all hardware (bucket bolts, casing bolts, etc.) is secure.
4. **Set screws:** Check all set screws on pulleys, bearings, sprockets, sheaves, gear reducers, etc. Although some set screws may have been installed at the factory, shipment, handling, and installation could have loosened them. Please note that damage caused by loose set screws is not covered by warranty.
5. **Level:** Check that the head shaft is level.
6. **Drive:** Check for proper rotation of motor and gear reducer.
7. **Boot:** Adjust boot pulley take-up screws so that there is no slack in the belt and so that the boot shaft is level.
8. **Lubrication:** 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. **Interior:** Check the interior of the Bucket Elevator to ensure all tools, foreign materials, and other obstructions have been removed.
10. **Guards:** Check to ensure all covers, guards, safety devices or controls, and any interlocks to other equipment are installed and operating properly.

## 4.2. START-UP & BREAK-IN

---

At start-up, operate the Bucket Elevator under power and without load for approximately 24 hours to break it in.

Watch for bearings heating up, unusual noises, or drive misalignment. Should any problems 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 misalignment of casings and pulleys can require excessive maintenance and cause poor life expectancy.

2. Check assembly and mounting bolts and set screws; tighten if necessary.
3. Be sure that the belt is properly aligned and running in the center of the head and boot pulleys.
  - If the belt is not operating in the pulleys, adjust the boot pulley take-up screws so that the belt will track. Remember, a belt will seek the high side of a pulley.
  - You may have difficulty with a belt that does not track even after adjustment of the boot pulley. It may tend to work to one side or the other. This usually means that the Bucket Elevator has gone out of plumb or the head shaft is not level. Remember that the head shaft and boot shaft must operate parallel to each other.
4. Belting tends to stretch slightly during initial operation. This is not unusual, and special care should be given to belt tension during the first one to two weeks of operation.
  - Belting manufacturers allow tolerances of 2% to 3% in initial stretch—as much as 61 cm to 91 cm in 30 m of belting.
  - After frequent belt tightening during the first week, you may need to raise the boot pulley and re-splice the belt to reduce its length. See “Belt And Bucket Installation” on page 31. Remember, belting will expand and contract under varying conditions of temperature and humidity.
5. After the Bucket Elevator is running well, stop and lock out all power and check the inlet hopper and discharge to ensure they are clear and material flow will not be impeded in any way.

### WARNING



Amputation Hazard!

To prevent serious injury, lock out power before removing cover or inspection door.

6. Restart the Bucket Elevator and gradually feed material. Gradually increase the feed rate until the design capacity is reached.

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

7. Cut off feed and allow the Bucket Elevator to empty. Lock out power supply. Check all bolts and alignments. Realign as necessary, tighten all bolts, and check belt adjustment.
8. Check motor amperage frequently to ensure motor is not overloaded.

9. Check the belt tension periodically. It may be necessary to readjust belt tension after running material in the conveyor.
10. If “back-legging” occurs in the loaded condition, it could be caused by one or more of the following conditions:
  - The head shaft RPM may be improper if the wrong sheaves for reversing of sheaves on the motor and gear reducer were installed.
  - Restriction at the head discharge or spouting system that is restricting exit of material from the head.
  - Check for a mis-adjustment of the rubber throat wiper in the head. The wiper should have clearance of 1/8” to 1/4” between it and the lip of the buckets. See “Adjust Throat Plate Wiper” on page 34.
  - Material is being fed too fast and that the buckets are being overfilled.
11. If the Bucket Elevator will not be operated for a prolonged period of time (one month or longer), operate it until cleared of all material. See “Bucket Elevator Extended Shutdown / Storage” on page 34. This is particularly important when the material elevated tends to harden, become more viscous or sticky, or spoils if allowed to stand for a period of time.

## 4.3. GENERAL

---

- Run the Bucket Elevator empty for a few minutes *periodically* to check for excessive vibration, loose fasteners, security of covers and guards, noise, and bearing and drive temperature.
- Always operate the Bucket Elevator with covers, guards, and safety labels in place.
- Always practice good housekeeping and keep a clear view of the conveyor loading, discharges and all safety devices.



# 5. Maintenance & Storage

**Warning:** Before continuing, please reread the safety information relevant to this section in the safety section of this manual. Failure to follow the safety instructions can result in serious injury, death, or property damage.

Before any maintenance or inspection is performed, shut off and lock out power source.

## 5.1. BUCKET ELEVATOR MAINTENANCE

---

1. Practice good housekeeping
  - Keep the area around the Bucket Elevator and drive clean and free of obstacles for easy access and to avoid interference with the function of the Bucket Elevator and drive.
2. Oil gear reducer
  - The shaft mounted gear reducer is lubricated by an oil reservoir in the housing. The correct amount of oil is important to the proper operation of the reducer. Too much oil may cause leakage or overheating. Too little oil may cause overheating or damage to internal parts.

### NOTICE

Gear reducers are normally shipped from the factory without oil. They must be lubricated before use or damage to equipment will occur.

- The gear reducer's maintenance instructions provide a list of recommended lubricants and oil change periods.
3. Check oil level
    - Periodically when the unit is not operating and add oil as required.
  4. Keep breather openings clear at all times to prevent pressure build-up in the reducer.
  5. Bearings
    - All bearings used on UIW Bucket Elevators are anti-friction, ball, or roller type pillow blocks. Check the bearing's maintenance instructions for the type of grease and the lubrication intervals.
    - The frequency of lubrication depends on several conditions such as hours of operation, temperature, moisture, speed, and contaminants.
    - When lubricating, the bearing manufacturer recommends that you add grease slowly and use a sufficient volume to purge the bearing of old lubricant. It is preferable to rotate the bearings during lubrication where good safety practice permits.
  6. Immediately investigate any unusual noise or vibration change.

7. Check the belt frequently to make certain that is running in the center of the pulleys.

**NOTICE**

A belt that is running improperly can quickly wear a hole in the side of the head, boot, or casing.

8. Bucket Bolts
  - Check and tighten all bucket bolts after the first week of operation. Check regularly thereafter.
9. Establish routine periodic inspections of the entire Bucket Elevator to ensure continuous maximum operating performance.
10. Replacement parts can be identified from a copy of the original packing list, invoice, or drawing.
11. Periodic inspections should be made on the following:

Casing	Check for wear and alignment. Tighten all bolts.
Shafts	Check for wear and misalignment.
Buckets	Check for wear or damage.
Bolts, Nuts, Set Screws	Check for tightness.
Seals	Check for leakage, adjustment, and wear.
Bearings	Check for lubrication and noise.
Pulleys	Check for wear and alignment.
Belt	Check for damage and alignment.
Take-Up	Check belt tension. (If take-up is fully adjusted, a section of belting will need to be removed.)  Adjust take-up to remove excess slack from chain making sure that adjustment screws have been tightened equally to prevent misalignment.
Gear Reducer	Check for oil level and noise.
V-Belt / Chain Drive	Check belt/chain tension and adjust as required.
Guards	Check for oil level (if applicable). Check nuts and bolts for tightness.

## 5.2. TORQUE-ARM II SPEED REDUCER MAINTENANCE

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### 5.2.1. BUSHING REMOVAL FOR STANDARD TAPER BUSHINGS

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1. Remove bushing screws.
2. Place the screws in the threaded holes provided in the bushing flanges. Tighten the screws alternately and evenly until the bushings are free on the

- shaft. For ease of tightening screws make sure screw threads and threaded holes in the bushing flanges are clean.
3. Locate two (2) wedges at 180° between the bushing flange and the bushing backup plate. Drive the wedges alternately and evenly until the bushing is free on the shaft.
  4. Remove the outside bushing, the reducer, and then the inboard bushing.

## 5.2.2. LUBRICATION

**Important:** *Because reducer is shipped without oil, it is necessary to add the proper amount of oil before operating reducer. Use a high-grade petroleum base rust and oxidation inhibited (R&O) gear oil - see tables. Follow instructions on reducer warning tags, and in the installation manual.*

Under average industrial operating conditions, the lubricant should be changed every 2500 hours of operation or every 6 months, whichever occurs first. Drain reducer and flush with kerosene, clean magnetic drain plug and refill to proper level with new lubricant.

<b>CAUTION</b>	
	<p>Too much oil will cause overheating and too little will result in gear failure. Check oil level regularly. Failure to observe this precaution could result in bodily injury.</p>

Under extreme operating conditions, such as rapid rise and fall of temperature, dust, dirt, chemical particles, chemical fumes, or oil sump temperatures above 200°F, the oil should be changed every 1 to 3 months, depending on severity of conditions.

**Table 5.1**

Reducer Size	Approx. Volume of Oil to Fill Reducer to Oil Level Plug	
	Position B	
	Qt	L
TA0107L	0.5	0.5
TA1107H	0.7	0.7
TA2115H	1.1	1.1
TA3203H	1.5	1.4
TA4207H	2.5	2.4
TA5215H	4.7	4.4
TA6307H	5.5	5.2
TA7315H	10.8	10.3

**Note:** *Oil quantity is approximate. Service with lubricant until oil runs out of oil level hole.*

**Note:** *Assumes auxiliary cooling where recommended in the catalog.*

*Pour point of lubricant selected should be at least 10°F lower than expected minimum ambient starting temperature.*

**Table 5.2**

ISO Grades For Ambient Temperatures of 50° F to 125°F.								
Output RPM	Torque-Arm II Reducer Size							
	TA0107L	TA1107H	TA2115H	TA3203H	TA4207H	TA5215H	TA6307H	TA7315H
301- 400	320	320	320	220	220	220	220	220
201-300	320	320	320	220	220	220	220	220
151- 200	320	320	320	220	220	220	220	220
126 -150	320	320	320	220	220	220	220	220
101- 125	320	320	320	320	220	220	220	220
81- 100	320	320	320	320	320	220	220	220
41 - 80	320	320	320	320	320	220	220	220
11- 40	320	320	320	320	320	320	320	320
1 -10	320	320	320	320	320	320	320	320

**Table 5.3**

ISO Grades For Ambient Temperatures of 15°F to 60°F .								
Output RPM	Torque-Arm II Reducer Size							
	TA0107L	TA1107H	TA2115H	TA3203H	TA4207H	TA5215H	TA6307H	TA7315H
301 - 400	220	220	220	150	150	150	150	150
201 - 300	220	220	220	150	150	150	150	150
151 - 200	220	220	220	150	150	150	150	150
126 - 150	220	220	220	150	150	150	150	150
101 - 125	220	220	220	220	150	150	150	150
81 - 100	220	220	220	220	220	150	150	150
41 - 80	220	220	220	220	220	150	150	150
11 - 40	220	220	220	220	220	220	220	220
1 - 10	220	220	220	220	220	220	220	220

*Extreme pressure (EP) lubricants are not necessary for average operating conditions. When properly selected for specific applications, TORQUE-ARM II backstops are suitable for use with EP lubricants.*

*For reducers operating in ambient temperatures between -22°F (-30°C) and 20°F (-6.6°C) use a synthetic hydrocarbon lubricant, 100 ISO grade or AGMA 3 grade (for example, Mobil SHC627). Above 125°F (51°C), consult Union Iron Works (217) 429-5148 for lubrication recommendation.*

*Mobil SHC630 Series oil is recommended for high ambient temperatures.*

## 5.3. BUCKET ELEVATOR EXTENDED SHUTDOWN / STORAGE

If the Bucket Elevator is to be shutdown for more than a month, the following should be performed:

1. Remove all foreign material from the Bucket Elevator and check that 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. **Storage Only:** Protect the Bucket Elevator from weather, moisture, and extreme temperatures. Do not use plastic or other coverings that promote condensation under the covering.
5. Coat all exposed metal surfaces with rust preventative oil according to the manufacturer's instructions.
6. **Storage Only:** Prior to start-up, the installation and operation instructions contained in this manual must be performed.

## 5.4. TORQUE-ARM II SPEED REDUCER STORAGE

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During periods of long storage, or when waiting for delivery or installation of other equipment, special care should be taken to protect a gear reducer to have it ready to be in the best condition when placed into service.

By taking special precautions, problems such as seal leakage and reducer failure due to lack of lubrication, improper lubrication quantity, or contamination can be avoided. The following precautions will protect gear reducers during periods of extended storage:

### PREPARATION:

1. Drain oil from the unit. Add a vapor phase corrosion inhibiting oil (VCI-105 oil by Daubert Chemical Co.) in accordance with Table 5.4.
2. Seal the unit airtight. Replace the vent plug with a standard pipe plug and wire the vent to the unit.
3. Cover all unpainted exterior parts with a waxy rust preventative compound that will keep oxygen away from the bare metal. (Non-Rust X-110 by Daubert Chemical Co. or equivalent)
4. The instruction manuals and lubrication tags are paper and must be kept dry. Either remove these documents and store them inside, or cover the unit with a durable waterproof cover which can keep moisture away.
5. Protect reducer from dust, moisture, and other contaminants by storing the unit in a dry area.
6. In damp environments, the reducer should be packed inside a moisture-proof container or an envelope of polyethylene containing a desiccant material. If the reducer is to be stored outdoors, cover the entire exterior with a rust preventative.

When placing the reducer into service:

1. Fill the unit to the proper oil level using a recommended lubricant. The VCI oil will not affect the new lubricant.
2. Clean the shaft extensions with petroleum solvents.
3. Assemble the vent plug into the proper hole.

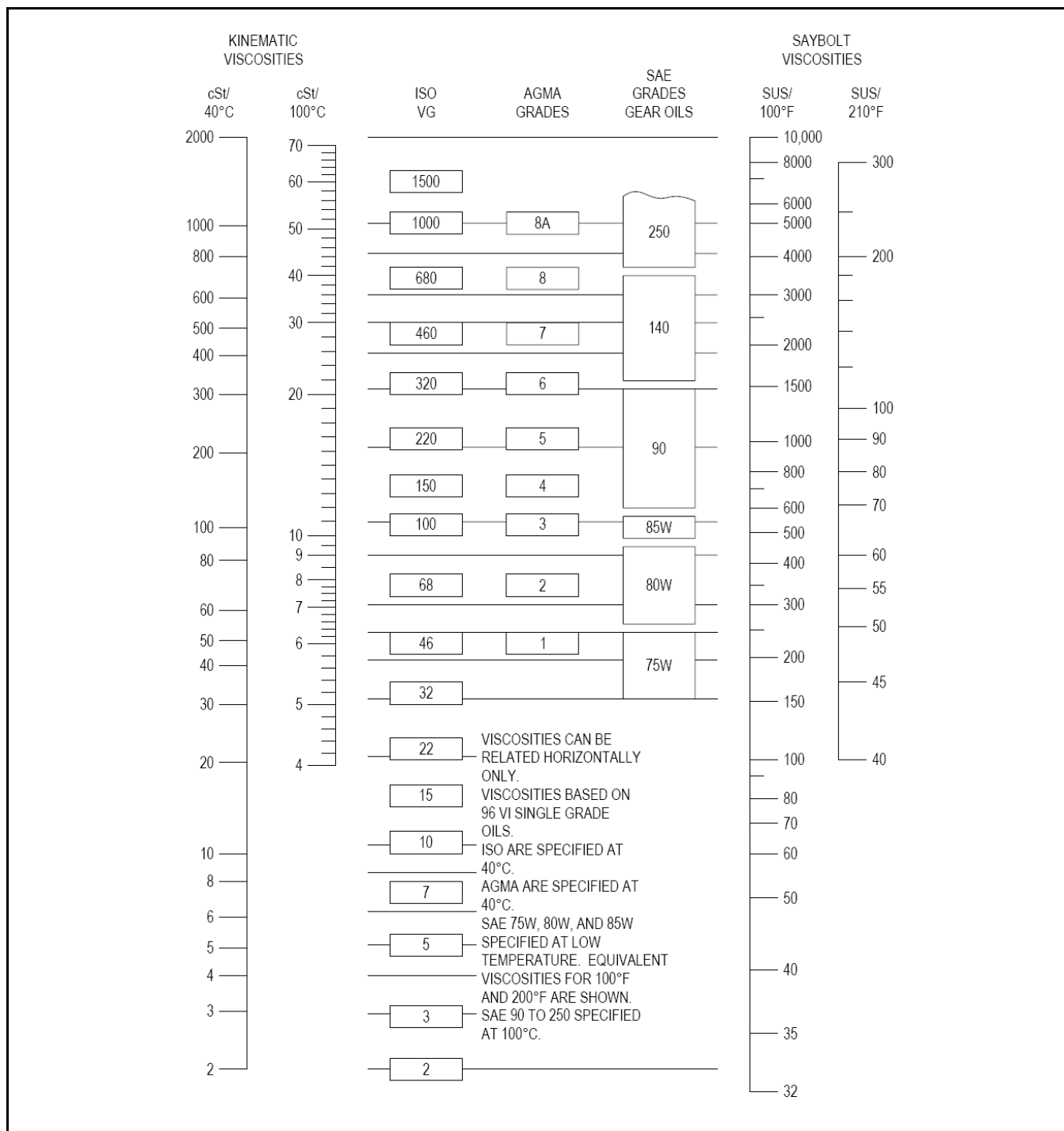
Follow the installation instructions provided in this manual.

VCI #105 and #10 are interchangeable.

VCI #105 is more readily available.


**Table 5.4 Quantities of VCI #105 Oil**

Reducer Size	Quantity (Ounces / Millilitre)
TA0107L	1 / 30
TA1107H	1 / 30
TA2115H	1 / 30
TA3203H	1 / 30
TA4207H	1 / 30
TA5215H	2 / 59
TA6307H	2 / 59
TA7315H	3 / 89



**Figure 5.1**

## BACKSTOPS

WARNING	
	To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Remove all external loads from drive before removing or servicing drive or accessories. Failure to observe these precautions could result in bodily injury.

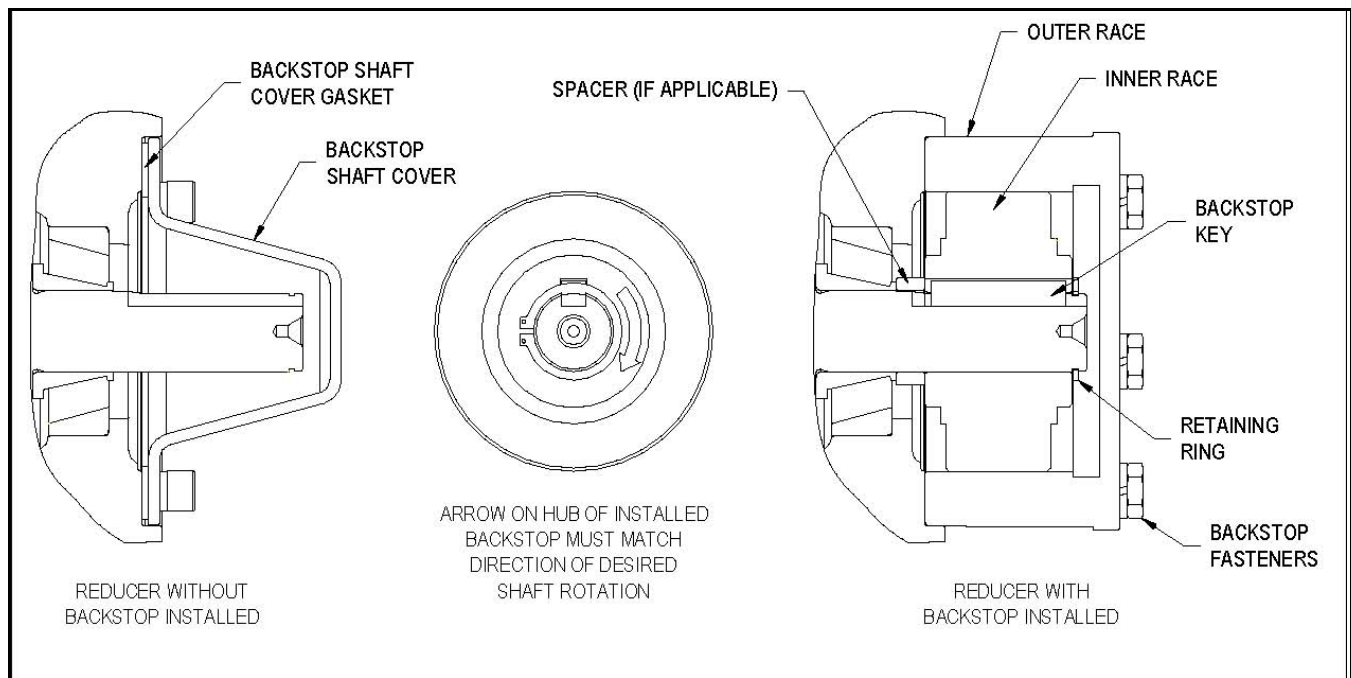
1. Remove backstop shaft cover and gasket, shown in Figure 5.2. These parts will not be reused. This cover is directly opposite the extended end of the input shaft.
2. Clean the face of the gearbox to remove any gasket material or contamination from the cover mounting surface. It is important that contamination not get into the gearbox or the backstop during the backstop installation/servicing process.
3. Face reducer looking at the side from which the cover was removed. Determine carefully the desired direction of free rotation. It is important that the direction be correctly determined because to reverse the direction after the backstop is installed, it is necessary to remove the backstop, turn it end-for-end and then reinstall it.
4. Match the arrow on the backstop inner race to the direction of free rotation for the desired shaft. Note that reversing the backstop end-for end changes the direction of the arrow. The shaft will rotate in the same direction as the arrow on the backstop.
5. If the backstop kit has a spacer ring included, install it onto the shaft first, adjacent to the bearing inner ring.
6. Install the backstop inner race and sprag cage assembly onto the shaft. **DO NOT** remove the cage from the inner race or the shipping strap from the sprag set at this time. Insert the key into the inner race and mating shaft keyway. These parts should slip onto the shaft easily, a light coating of oil may assist in assembly. Do not use a hammer to force the installation, damage can occur to the shaft and/or the backstop. Slide the race against the spacer or the shaft shoulder and install the retaining ring into the groove in the shaft. Only use the supplied key, as it is specifically designed for each backstop.
7. Apply a thin coating of RTV silicone onto the gearbox mating surface for the outer race (same as the cover area). It is important to apply the sealant around the fastener holes to prevent leakage. Do not allow excessive amounts of silicone to enter the gearbox or to be applied to other parts.
8. Install the outer race by gently rotating it opposite the shaft rotation while pressing lightly inwards. Do not force the outer race into position as backstop damage may occur. Once the outer race is well piloted onto the sprag set, remove the shipping strap from the sprag set by cutting it, being careful not to let the outer race back off the sprags. The outer race should slide easily into

position with a slight turning motion. A light coating of oil on the race inner diameter may ease installation.

9. Align the fastener holes in the outer race with the mating holes in the gearbox. Use the supplied grade 5 fasteners and lock washers only. Torque the fasteners in an alternating pattern per Table 5.5.

**Table 5.5 Backstop Fastener Torque Values**

Reducer Size	Fastener Size	Torque in Ft.-Lbs.
TA0107L	1/4-20	8 – 7
TA1107H	1/4-20	8 – 7
TA2115H	1/4-20	8 – 7
TA3203H	1/4-20	8 – 7
TA4207H	1/4-20	8 – 7
TA5215H	5/16-18	17 – 15
TA6307H	5/16-18	17 – 15
TA7315H	3/8-16	30 – 27



**Figure 5.2**

# 6. Troubleshooting

PROBLEM	CAUSE	REMEDY
<p>Back legging. Material falling down the up- or down-side casing.</p>	<ul style="list-style-type: none"> <li>Obstruction in head.</li> </ul>	<ul style="list-style-type: none"> <li>Inspect head for foreign material such as bags, papers, pieces of wood, metal scrap, etc.</li> <li>Check for missing buckets. If one missing, it can usually be found in the discharge transition for in distributor interspout.</li> </ul>
	<ul style="list-style-type: none"> <li>Throat Wiper is out of adjustment.</li> </ul>	<ul style="list-style-type: none"> <li>Remove head cover cap and adjust wiper.</li> </ul>
	<ul style="list-style-type: none"> <li>Obstruction in distributor interspout or spouting.</li> </ul>	<ul style="list-style-type: none"> <li>Inspect distributor and spouting. Correct condition as required.</li> </ul>
	<ul style="list-style-type: none"> <li>Buckets being overfilled.</li> </ul>	<ul style="list-style-type: none"> <li>Remove inspection door and use a strobe light while elevator is running to see if buckets are being overfilled. Buckets should be near full, but not overflowing.</li> <li>Check head pulley speed and capacity of in-feed and discharge side conveyors.</li> </ul>
	<ul style="list-style-type: none"> <li>Head shaft running too fast.</li> </ul>	<ul style="list-style-type: none"> <li>Check drawing to be sure correct Sheaves are properly installed.</li> <li>Check gear reducer for correct reduction ratio.</li> </ul>
	<ul style="list-style-type: none"> <li>Spouting size is too small for elevator capability.</li> <li>Spouting installed in too flat a position for good flow.</li> <li>Spouting has a sharp bend which restricts flow.</li> </ul>	<ul style="list-style-type: none"> <li>Correct by using correct size spouting and good design engineering.</li> </ul>
	<ul style="list-style-type: none"> <li>Buckets loose.</li> </ul>	<ul style="list-style-type: none"> <li>Tighten all bucket bolts securely.</li> </ul>
	<ul style="list-style-type: none"> <li>Damaged buckets.</li> </ul>	<ul style="list-style-type: none"> <li>Replace as required. Determine cause of damage.</li> </ul>
	<ul style="list-style-type: none"> <li>Elevating light material.</li> </ul>	<ul style="list-style-type: none"> <li>Replace buckets with perforated buckets.</li> </ul>
	<ul style="list-style-type: none"> <li>Belt loose.</li> </ul>	<ul style="list-style-type: none"> <li>Tighten take-up screws or re-splice belt as required.</li> </ul>
<ul style="list-style-type: none"> <li>Air locked.</li> </ul>	<ul style="list-style-type: none"> <li>Vent may be needed to at the boot or in the load.</li> </ul>	

PROBLEM	CAUSE	REMEDY
Elevator being overloaded.	<ul style="list-style-type: none"> <li>Feed conveyor running too fast.</li> </ul>	<ul style="list-style-type: none"> <li>Check conveyor speed.</li> </ul>
	<ul style="list-style-type: none"> <li>Pit hopper baffle misadjusted.</li> </ul>	<ul style="list-style-type: none"> <li>Adjust to restrict flow of material.</li> </ul>
	<ul style="list-style-type: none"> <li>Head pulley running too slow.</li> </ul>	<ul style="list-style-type: none"> <li>Check pulley speed.</li> <li>Check drawing to be sure correct sheaves are properly installed.</li> <li>Check gear reducer for correct reduction ratio.</li> </ul>
Low capacity.	<ul style="list-style-type: none"> <li>Head shaft speed too slow.</li> </ul>	<ul style="list-style-type: none"> <li>Check pulley speed.</li> <li>Check sheaves, gear reducer, and motor to determine cause of slow speed. Correct as required.</li> </ul>
	<ul style="list-style-type: none"> <li>Feed conveyor running too slow or obstruction in conveyor.</li> </ul>	<ul style="list-style-type: none"> <li>Check conveyor speed. Correct as required.</li> <li>Remove any obstructions.</li> </ul>
	<ul style="list-style-type: none"> <li>Baffle plate in pit hopper adjusted too low.</li> </ul>	<ul style="list-style-type: none"> <li>Raise baffle plate.</li> </ul>
	<ul style="list-style-type: none"> <li>Obstruction in boot or feeding boot in wrong location.</li> </ul>	<ul style="list-style-type: none"> <li>Clean boot and remove any obstructions.</li> <li>Check recommendations for location of inlet hoppers.</li> </ul>
	<ul style="list-style-type: none"> <li>Missing buckets.</li> </ul>	<ul style="list-style-type: none"> <li>Replace buckets.</li> </ul>
	<ul style="list-style-type: none"> <li>Elevating light material.</li> </ul>	<ul style="list-style-type: none"> <li>Use perforated buckets.</li> </ul>
	<ul style="list-style-type: none"> <li>Air lock.</li> </ul>	<ul style="list-style-type: none"> <li>Install vent in bins being loaded or in elevator head or boot.</li> </ul>
	<ul style="list-style-type: none"> <li>Spouting too small or too flat.</li> </ul>	<ul style="list-style-type: none"> <li>Check recommendations for sizing and slope.</li> </ul>
	<ul style="list-style-type: none"> <li>Belt loose.</li> </ul>	<ul style="list-style-type: none"> <li>Check for slippage. Make sure belt is snug.</li> <li>Check head pulley lagging and replace if worn.</li> </ul>
	<ul style="list-style-type: none"> <li>Buckets damaged or caked.</li> </ul>	<ul style="list-style-type: none"> <li>Visually inspect, clean, or replace damaged buckets.</li> </ul>
Bearing failure.	<ul style="list-style-type: none"> <li>Material getting into bearing.</li> </ul>	<ul style="list-style-type: none"> <li>Add or upgrade seal to keep material out of bearing.</li> </ul>

PROBLEM	CAUSE	REMEMDY
Belt not tracking in center of pulleys. Belt rubbing side of head, boot, or casing.	<ul style="list-style-type: none"> <li>• Boot pulley improperly adjusted.</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust take-up screws on boot to level pulley and align belt in center of pulley.</li> </ul>
	<ul style="list-style-type: none"> <li>• Elevator casing out of plumb, twisted, or bent.</li> </ul>	<ul style="list-style-type: none"> <li>• Use a surveyor's transit to check plumb. Correct out of plumb condition by using turnbuckles to adjust guy lines or adjust braces.</li> <li>• Replace or repair bent casing.</li> </ul>
	<ul style="list-style-type: none"> <li>• Head pulley not level.</li> </ul>	<ul style="list-style-type: none"> <li>• Place shims under pillow block bearings to level pulley.</li> </ul>
	<ul style="list-style-type: none"> <li>• Head pulley lagging worn.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace with new lagging kit.</li> </ul>
	<ul style="list-style-type: none"> <li>• Pulley has no crown.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace pulley.</li> </ul>
	<ul style="list-style-type: none"> <li>• Failed bearings.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace defective bearing on head or boot shaft.</li> </ul>
Bucket bolts pull through belt or belt tears at bolt hole.	<ul style="list-style-type: none"> <li>• Material build up on pulley.</li> </ul>	<ul style="list-style-type: none"> <li>• Clean pulleys or use slatted pulley at boot.</li> </ul>
	<ul style="list-style-type: none"> <li>• Bucket bolts not tight.</li> </ul>	<ul style="list-style-type: none"> <li>• Frequently inspect and tighten bucket bolts.</li> </ul>
	<ul style="list-style-type: none"> <li>• Inadequate belt construction for bolt-holding.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace belt with proper design.</li> </ul>
	<ul style="list-style-type: none"> <li>• Obstruction in casing or insufficient clearance.</li> </ul>	<ul style="list-style-type: none"> <li>• Remove obstruction.</li> <li>• Check belt for proper tracking and align pulleys if required.</li> <li>• Check casing for proper bucket clearance.</li> </ul>
	<ul style="list-style-type: none"> <li>• Jammed boot.</li> </ul>	<ul style="list-style-type: none"> <li>• Clean out boot.</li> </ul>
	<ul style="list-style-type: none"> <li>• Pulleys too small or incorrect splice strains bolts as belt flexes.</li> </ul>	<ul style="list-style-type: none"> <li>• Install larger head pulley if possible. Use correct splice.</li> <li>• Check possibility of using thinner belt.</li> </ul>
Excessive belt slippage or burning.	<ul style="list-style-type: none"> <li>• Lump size or weight in buckets increased from original design.</li> </ul>	<ul style="list-style-type: none"> <li>• Change feed design in boot to handle larger lumps.</li> <li>• Change to heavier belt.</li> </ul>
	<ul style="list-style-type: none"> <li>• Head pulley lagging worn or loose.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace with factory recommended lagging.</li> </ul>
Excessive belt looseness.	<ul style="list-style-type: none"> <li>• Belt has stretched.</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust belt tension with boot pulley.</li> <li>• Take up screws. If screws have reached the end of their adjustment, it will be necessary to re-splice the belt.</li> </ul>
	<ul style="list-style-type: none"> <li>• Material down-lagging and getting between bucket and belt.</li> </ul>	<ul style="list-style-type: none"> <li>• Change speed to effect better discharge.</li> </ul>
Belt cover wearing excessively on bucket side.	<ul style="list-style-type: none"> <li>• Fine abrasive material between bucket and belt.</li> </ul>	<ul style="list-style-type: none"> <li>• Install rubber washers or bucket pad between bucket and belt.</li> </ul>
	<ul style="list-style-type: none"> <li>• Too light a cover gauge or improper belt quality.</li> </ul>	<ul style="list-style-type: none"> <li>• Upgrade belt.</li> </ul>

PROBLEM	CAUSE	REMEDY
Belt carcass breaks.	<ul style="list-style-type: none"> <li>Lumps dropping between belt and boot pulley.</li> </ul>	<ul style="list-style-type: none"> <li>Use slatted boot pulley.</li> </ul>
	<ul style="list-style-type: none"> <li>Operating tension is higher than maximum allowable working tension of belt.</li> </ul>	<ul style="list-style-type: none"> <li>Replace belt with correct design.</li> </ul>

PROBLEM	CAUSE	REMEDY
Caking on buckets.	<ul style="list-style-type: none"> <li>Wet or powder type material.</li> </ul>	<ul style="list-style-type: none"> <li>Material too wet.</li> </ul>
Damaged buckets.	<ul style="list-style-type: none"> <li>Belt loose.</li> </ul>	<ul style="list-style-type: none"> <li>Tighten take-up screws or re-splice belt as required.</li> </ul>
	<ul style="list-style-type: none"> <li>Casing bowed and catching.</li> </ul>	<ul style="list-style-type: none"> <li>Re-plumb as required.</li> </ul>
	<ul style="list-style-type: none"> <li>Obstruction in elevator.</li> </ul>	<ul style="list-style-type: none"> <li>Repair or remove.</li> </ul>
	<ul style="list-style-type: none"> <li>Buckets too large for casing.</li> </ul>	<ul style="list-style-type: none"> <li>Replace with proper size.</li> </ul>
	<ul style="list-style-type: none"> <li>Belt not running smooth.</li> </ul>	<ul style="list-style-type: none"> <li>May require special splice.</li> </ul>

PROBLEM	CAUSE	REMEDY
Excessive wear on pulley side of cover.	<ul style="list-style-type: none"> <li>Abrasive material between belt and boot pulley.</li> </ul>	<ul style="list-style-type: none"> <li>Use slatted boot pulley.</li> </ul>
	<ul style="list-style-type: none"> <li>Belt slips at head pulley.</li> </ul>	<ul style="list-style-type: none"> <li>Replace worn lagging.</li> <li>If necessary, adjust take-up screws to increase belt tension.</li> </ul>
	<ul style="list-style-type: none"> <li>Too light a cover gauge or improper belt quality.</li> </ul>	<ul style="list-style-type: none"> <li>Upgrade belt.</li> </ul>
Build up on boot pulley.	<ul style="list-style-type: none"> <li>Powder or sticky material.</li> </ul>	<ul style="list-style-type: none"> <li>Slatted boot pulley required.</li> </ul>

## LIMITED WARRANTY

Seller warrants that all of the goods sold hereunder will conform to their description in Seller's published literature current at the time the Buyer's order is accepted, that Seller will use good material and workmanship in the manufacture of such goods, and that such goods will conform to applicable laws and regulations regarding purity.

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