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BULK MATERIAL HANDLING

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BELT – BUCKET ELEVATOR INSTALLATION AND MAINTENANCE MANUAL 150-750

SAFETY!

Never operate a SINCLAIR Bucket Elevator without the provided safety guards and accessories in place and operational. ALWAYS SHUT OFF THE AIR OR FLUID POWER LINES OR THE ELECTRICAL POWER WHILE INSTALLING OR WORKING ON THE ELEVATOR.

ELEVATOR BELT

A. STORAGE & HANDLING

The same principles and procedures apply for storage and handling of elevator belt as for conveyor belt. New conveyor belt should be stored upright in the factory package until used. For hoisting, a bar is passed through the hole in the center of the roll. Chains or cables looped around the bar ends should be provided with a spreader above the roll to avoid damage to the belt edges. Mount the roll on a suitable shaft for unrolling and threading onto the elevator. The elevator belting will normally have a rubber covering on the top and bottom side. One of the covers will be thicker than the other. The thicker cover should be installed against the face of the pulleys, with the thinner cover facing the buckets.

B. INSTALLATION

Take-up travel on elevator belts is usually limited due to the boot pulley arrangement for material pick-up. The confined space also makes splicing difficult; therefore, it is imperative that the take-up be positioned so that its full downward travel is available when the new belt is first installed. The ideal procedures for installing a new belt is to let the belt, with buckets bolted on, hang over the head pulley for 24 hours. Then pull the belt as tight as possible prior to fastening. This will remove most or all of the inherent stretch in a new belt. If this procedure is impractical, it is advisable to at least put the belt on as tight as possible to minimize take-up adjustment.

C. BELT TROUBLESHOOTING

The most frequent causes of elevator belt damage are:

1. Improper clearance of buckets and belt. Keeping the buckets at least 1” narrower than the belt width up to 16” and 2” narrower than the belt when wider buckets are used will assist in maintaining proper clearance. Insuring that there are not projections of bolts or welds on the inside of the structure will prevent the buckets from hanging up and damaging the belt.
2. Buckets and bolts should be inspected frequently and tightened or replaced as necessary.
3. The boot should be kept clean at all times. Install sloping decking just above foot pulley to prevent any large particles from falling between the pulley and the belt and punching holes in the belt. Fluted or wing type boot pulleys are often desirable to prevent damage to the belt from trapped material.

INSTALLATION

Assembling Casing

1. A Bucket Elevator is actually a belt and pulley transmission enclosed within a casing.
2. For proper operation, care must be taken to maintain belt and shaft alignment.

3. Although Sinclair checks alignment prior to shipment, correct and proper care must be maintained during erection to assure a straight and plumb casing from head to boot section, as a twist or leaning casing would prevent proper tracking of belt on the pulleys.
4. Bucket Elevators are comprised of three main assemblies; namely, head terminal, boot terminal, and intermediate assemblies and components. All terminals are factory assembled and shipped assembled. All intermediate casings are shipped in individual pieces.
5. Assemble casing by first setting boot section and ten to twenty feet of intermediate leg casing. Use a plumb line from top to bottom to check vertical and level setting of boot on base, using shims if necessary near anchor bolts (not at corners). Grout under boot after elevator is completely assembled.
6. Assemble remaining intermediate leg sections respectively as marked at the factory. Usually the boot will be marked "A", then the first leg section "B", second "C", et cetera. These markings will be located in the lower right corner of each section and after assembly can be readily checked by sight from bottom to top.

Take-Ups

Take-ups, a mechanical device for adjusting shaft center distances, will be provided for all elevators to compensate for elongation as wear occurs and to provide temporary slack for installation or maintenance work. Whenever possible, take-ups on elevators will be mounted at the foot end. This eliminates the troublesome adjustment of the drive, as is the case when the take-up is mounted on the head end. For elevators, caution must be used when adjusting take-ups to prevent statically over-stressing belt and terminal equipment. A proper amount of slack should be allowed to obtain smooth belt travel motion. On all belt elevators the adjustment should be made while the elevator is in operation to insure the adjustment will meet the above conditions. *For counterweighted "gravity take-ups, BWSI normally does not ship weight in the weight box. It must be added at the job site. The amount of weight to add to the weight box is difficult to calculate. In some instances, the weight of the empty box, shafts, pulleys, and belt is sufficient to tension the elevator. In some instances, additional weight must be added. We suggest that you begin by adding some weight to the box, simultaneously observing the elevator to check for sufficient operating tension.*

Shaft and Pulley Alignment

Proper alignment of pulley and shaft greatly lengthens belt life. To assure correct alignment, the following steps are necessary:

1. Carefully level the shafts. Use a machinist's level directly on the shaft.
2. Align the shafts for parallelism, using a line for long centers. Recheck the level adjustment. Tighten all securing bolts and nuts to assure maintenance of shaft alignment.
3. Align the pulleys axially on the shafts. A plumb bob should be used to check the alignments of head and foot pulleys and shafting after leveling shafts. No more than ¼" variance is suggested.

Installing Belt

In the installation of elevator belts, certain general practices should be followed. The first is to be sure you select the best type of belt for the service to be performed. Consult Sinclair to check your selection.

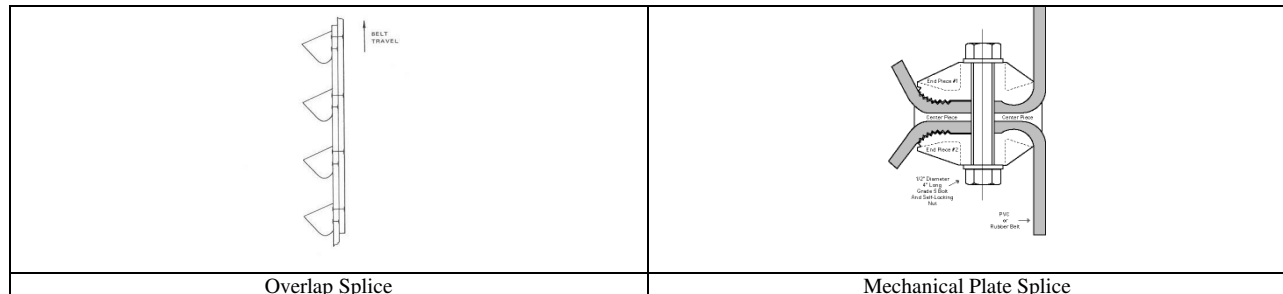
Install the elevator belt with foot take-ups positioned at upper end of travel, and head end take-ups at lower end of travel to provide for maximum adjustment.

1. Where it is possible to lower belt from the top of elevator casing, the following method can be applied: Make lifting hitch off center, to make one leg long enough to go around the foot pulley and up to the inspection doors. Lower belt into casing from top. When belt is positioned, snub the head shaft. Connect at inspection door using a come-along or chain fall to draw belt ends together. Adjust take-up.
2. If the belt cannot be lowered from the top of the elevator casing, assemble and feed belt through inspection door. Drop a line into the far side (opposite inspection door) of casing at the top. Feed the belt around the bottom of the foot pulley and upward to top of the head pulley. Next, drop line down nearside of casing. Hitch line 3 or 4 feet from the end of elevator belt leaving the end free to make the final connection at the inspection door. Before making the final connection be sure that the take-up is set properly. Cut belt length for splice and achieve the proper take-up setting. The method of installation is dependent to a large extent on the height of the elevator and the available hoisting equipment. After the belt is assembled, mount the

buckets. After the unit has been run-in, the bolts should be re-tightened, and the bolt threads should be prick-punched to prevent loosening of nuts.

Belt Splicing

The number of plies and the severity of service required determine the method of belt splicing. For most elevators an “overlap splice” can be used. For belt thickness up thru six-ply, the belt ends are overlapped for a minimum of three buckets. These buckets are bolted through both belts. For belt thickness of seven-ply or more, a mechanical plate splice is more satisfactory than the lap type splice because severe stresses are set up in the outer plies as the belt passes around the head and boot pulleys. These stresses are minimized when the two ends of the belt are fitted with the clamping plate splice system.



Mounting Elevator Buckets

Elevator buckets are generally secured to belts by means of flat head bolts known as “elevator bolts - No.1 head,” having American standard hex nuts. These bolts are also called “Norway” bolts. No. 2 oval head bolts are used with the heaviest belts and buckets. Leather or polymer washers are sometimes used between the bucket and belt to absorb shock when buckets pass over pulleys. They also serve as spacers to reduce accumulation of material between the bucket and belt, and help seal the boltholes against moisture. One washer is used per bolt. The belt carrying the buckets should be at least 1 inch wider than the bucket for bucket widths up to 16 inches, and 2 inches wider than the bucket for widths 16 inches and over. When two lines of buckets are used on the same belt they should be staggered with respect to each other.

Prevent Overload

For a bulk material-handling elevator, flow of material should always be regulated at a rate within elevator capacity. Where surging and overloading are inevitable, a surge hopper of adequate size should be provided from which material can be withdrawn by a suitable feeder or regulating gate. Overload protection can also be provided by the installation of shear-pin hubs. Backstops will be provided to prevent back run of a loaded elevator in the event of a power failure.

Starting and Stopping

Although SINCLAIR elevators are always designed and engineered to start under full load, wherever possible the elevator should be empty when starting and should be stopped only when again empty. Starting under load not only places extra strain on the equipment, but also frequently contributes directly to breakdowns. This is particularly true when handling bulk materials that tend to set or freeze, since a very great pull may be required to break the load loose. Elevators should be operated at regular intervals during any extended down period to avoid freeze-ups (at least once a week, and preferably turned over once each day when sticky materials are handled).

MAINTENANCE

Preventive maintenance and periodic inspection will do much to prolong the life of your elevator belt. A regular inspection should be set up on a periodic basis. The frequency of inspection will depend entirely on the type of operation and the operating conditions. If the elevator is operating in exposed, dusty or dirty conditions, inspection

should be conducted at more frequent intervals. The following maintenance tips will do much to add life to your equipment.

1. On large elevators, provide suitable walkways and, where necessary, platforms with stairways or permanent ladders for access.
2. Provide proper protection against the elements: extreme cold, rain or snow and sleet.
3. Provide pipe extension for difficult-to-reach grease fittings or an automatic greasing system.
4. Provide adequate cleanup of dribble and spillage.
5. Set up a specific lubrication program and fix definite responsibilities for carrying out each procedure. One successful method for accomplishing this is to prepare a master lubrication check sheet or card for each elevator.
6. Establish a definite program of inspection.
7. Elevator belts should be checked for wear, stretch, edge wear (indicating mis-alignment, material build up on belt or pulleys).
8. Pulleys should be examined for alignment and positioning.
9. Buckets should be examined for looseness or damage.
10. All belts should be checked for proper tension (enough slack to flex slightly) and if too much slack is present, take-ups should be adjusted to take up excess slack.

ELEVATOR BELT TROUBLE SHOOTING

- A. Bucket bolts pull through belt or belt tears at bolt hole:
1. *Bucket bolts not tight.* Inspect frequently and tighten as required.
 2. *Inadequate belt construction for holding bolts.* Replace belt with one properly designed.
 3. *Obstruction in casing or insufficient clearance.* Check terminal pulleys for proper alignment to insure straight-running belt. Redesign elevator if necessary.
 4. *Jammed boot.* Install controlled feed to help eliminate jams and turbulence in boot.
 5. *Pulleys too small or incorrect belt splice strains bolts as belt flexes.* Install larger head pulley if possible. Use correct splice. Check belt construction for possibility of thinner belt.
 6. *Change in service conditions.* Lump size or weight in buckets increased from original design. For larger lumps, change feed or boot design to accommodate. For heavier material, change belt construction to proper selection.
- B. Belt cover wears excessively on bucket (top) side:
1. *Bucket not completely discharging material.* Material downlegging and becoming trapped between bucket and belt cover. Change speed to improve discharging. Adjust discharge spout bottom plate more closely to bucket lip.
 2. *Fine abrasive material between bucket and belt cover.* Use rubber or leather washers or pads between bucket and belt cover.
 3. *Improper belt quality or cover gauge too tight.* Increase cover thickness and upgrade belt with replacement.
- C. Belt covers wear excessively on pulley (bottom) side:
1. *Abrasive material dropping between belt and boot pulley.* Use slotted or self-cleaning type of pulley.
 2. *Belt slips at head pulley.* Lag head pulley. If necessary, increase tension at terminal pulley.
 3. *Cover gauge too light or improper belt quality.* Increase cover thickness or upgrade belt on replacement.
- D. Belt carcass breaks:
1. *Lump material dropping between belt and pulley.* Use slotted or self-cleaning pulley.
 2. *Operating tension exceeds maximum allowable working rating of belt.* Calculate belt tension and install new belt with correct strength design.
- E. Cover separates from carcass:
1. *Service condition too severe.* Improve cover adhesion by using breaker between carcass and cover.
 2. *Temperature problems.* Check operating conditions to make certain that belt temperature allowable is not exceeded.

CAUTION: DO NOT OPERATE EQUIPMENT WITHOUT SAFETY GUARDS IN PLACE. LOCK OUT ALL POWER SUPPLIES BEFORE SERVICING ELEVATOR.

BWSI SERVICE TECHNICIANS ARE AVAILABLE FOR START-UP. CONTACT BWSI FOR RATES.