



Conveyor Belt Scale

Application Guide

Belt-Way Scales, Inc. Application Guide

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1. Introduction

This guide is intended to give installers and service technicians new to conveyor belt scales a basic understanding of scale components and the weighing environment to which they are applied. This guide is not a service manual for the conveyor belt scale, conveyors, or other equipment; and does not replace or nullify any service guidelines established by any other manufacturer.

This application guide is intended for Belt-Way Distributors, should be treated as confidential, and reproduced only with the express written approval of Belt-Way Scales, Inc.

2. Safety Precautions

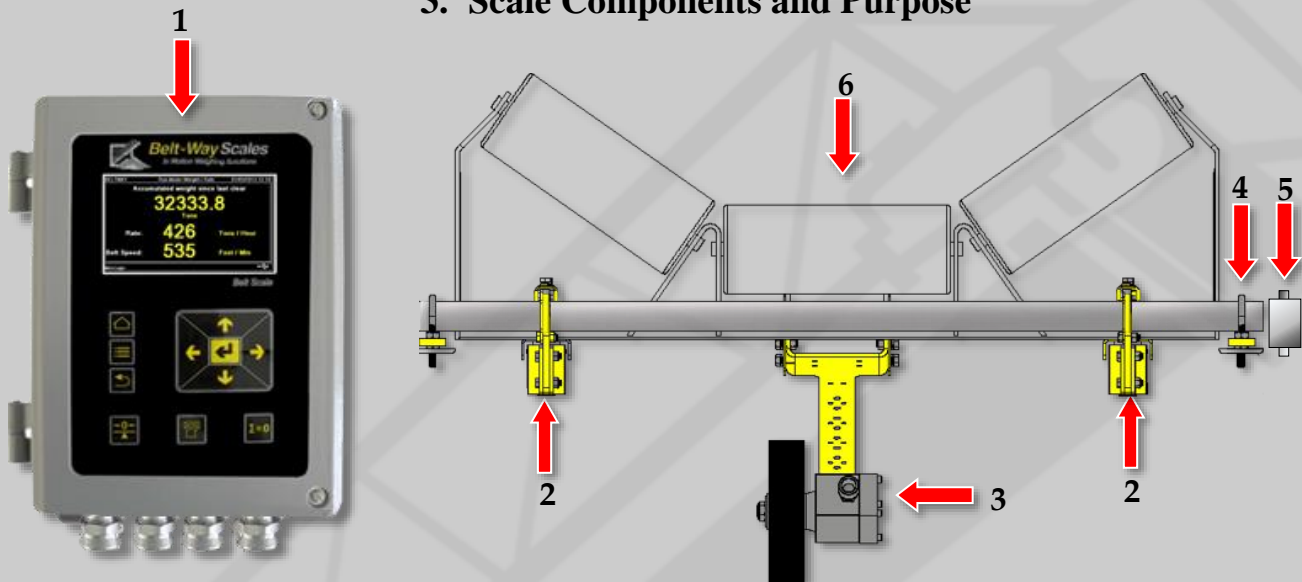
Warning!

Work on conveyor systems and all heavy machinery is hazardous. Serious injury or death may occur. Only experienced professionals are advised to install products manufactured by Belt-Way Scales, Inc. It is crucial that your company safety policy as well all OSHA and or MSHA regulations are followed. Please make sure you have read and fully understand the operation of the equipment and safety guidelines for any work done on conveyors, portable crushing and screening equipment, and transloading equipment. As some conveyors are automated, “Lock out! Tag out! and Test!” prior to starting work on any equipment.

The safety of the installer and maintenance personnel is a priority when installing, servicing and maintaining any conveyor belt scale and components. If you are not familiar with the scales and the conveyor operation and procedures, you must first seek assistance from someone with the necessary experience to help familiarize you with the equipment.

Belt-Way Scales Inc. is in no way liable for damages or injury incurred resulting from the installation. Further, use of the Belt-Way Self-Storing Test Weight system for safe calibration is recommended, as the need to handle free weights on ladders and catwalks is eliminated.

3. Scale Components and Purpose



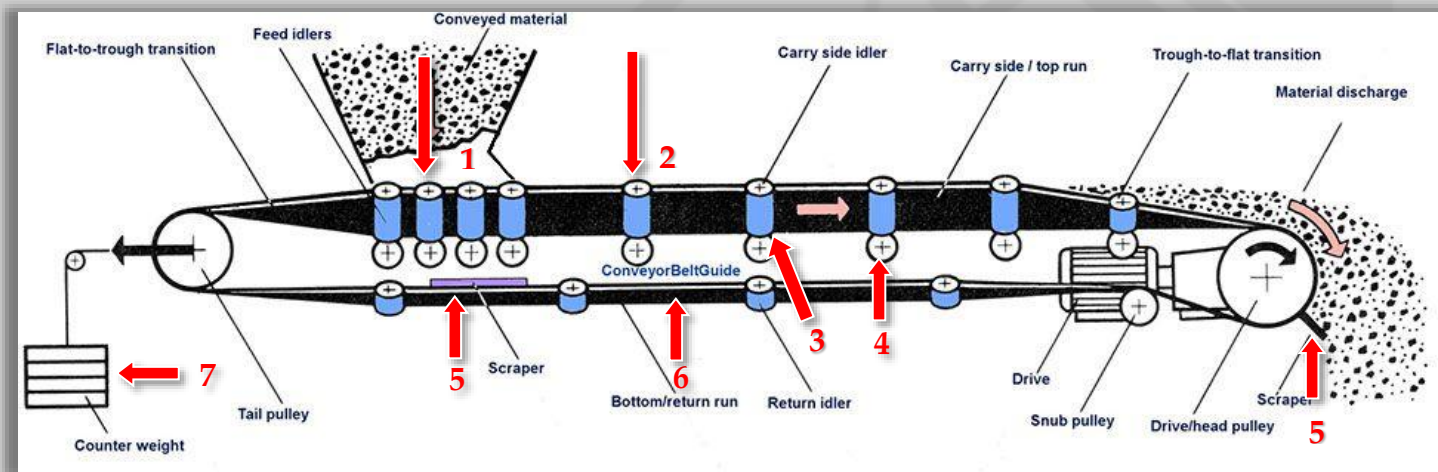
1. **Integrator:** A microprocessor with large graphic display is used to calibrate the scale and access a wide variety of data.
2. **Load Cell A & B:** Consists of a strain gauge which takes an excitation voltage and changes the signal voltage to the Integrator, depending on the amount of force / Load applied to the load cell.
3. **Speed Sensor:** Creates pulses and it sends a signal to the integrator so speed can be calculated.
4. **Mounting Hardware:** Hardware needed to install the scale.
5. **Automatic Angle Compensator:** This sensor measures the angle of the CONVEYOR and sends this signal to the scale integrator. The integrator will then automatically compensate and change the weight based on the difference in conveyor angle. This item bolts directly to the conveyor frame.
6. **Conveyor Idler:** The existing idler is mounted to the Load Cell Assemblies (the weight sensors).

4. Parts Identification, Function & Scale Performance Affects

4.1. General

Mechanical consistency of the weighing environment is crucial for good scale performance.

Idler Types and Parts Identification



- 1) Impact Idlers support belt under feed hopper.
- 2) All idlers are aligned with rollers flush across the top.
- 3) Top of the center roller min. ½" higher than crown of the head & tail pulley.
- 4) Scale must be placed a minimum of 1 idler from the feed point and 1 idler from last roller before transition roller.
- 5) Belt Scrapers on both sides of the belt prevent excessive material build-up.
- 6) When using the standard speed sensor wheel, the point of contact on the return belt should be between return rollers to insure tracking.
- 7) A gravity take-up provides automatic belt tensioning.

Trough Roller converted to a Scale Idler

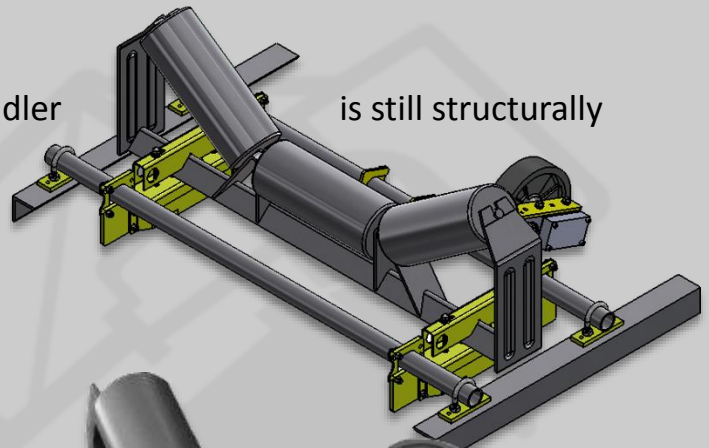
Cut Idler foot off at a 45° angle and make sure the idler is still structurally sound.

Potential Idler Conditions (Weighbridge Area):

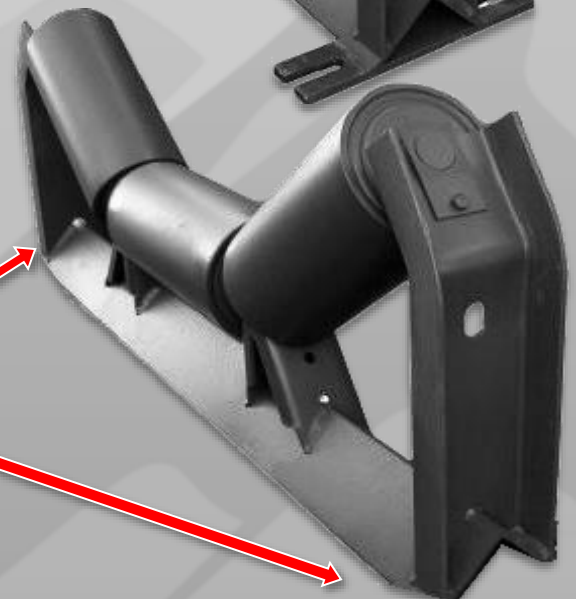
- Incorrect Type and Angle
- Collapsed or seized bearings
- Seized Rollers
- Twisted Idlers
- Weak or Structurally Unsound Idlers

Potential Scale Issues:

- Unbalanced loading across the scale.
- Flat spots on the idler roller causing slapping, vibration and erratic scale readings.
- Twisted or weak idlers cause excessive vibration and torque on the scale
- There are many different styles of idlers. The idler is the complete unit that usually has 3 rollers (2 Wing and 1 Center Roller).



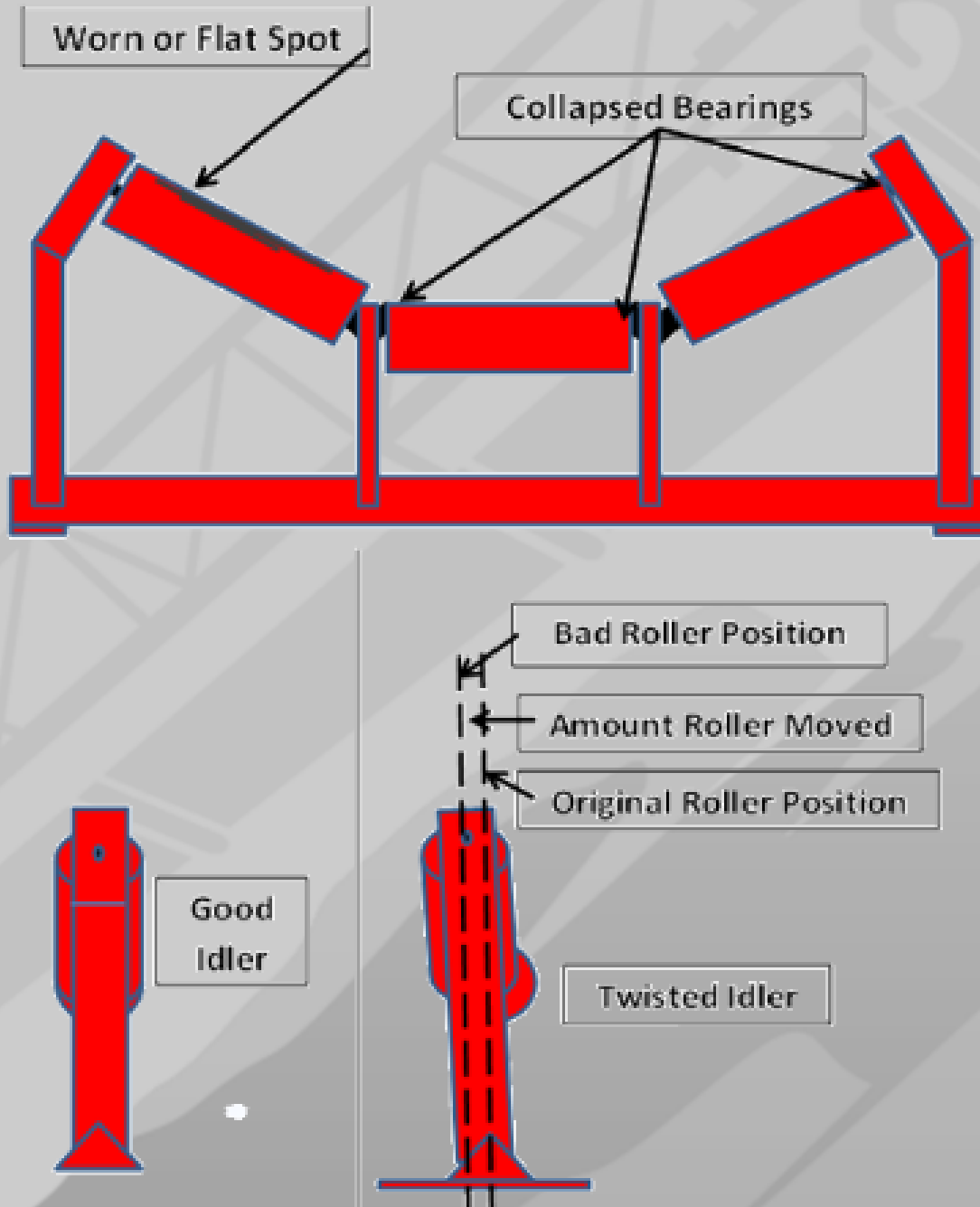
is still structurally



Best Practice Note:
Mounting Feet Removed Prior to Installation on Weighing Elements (Load Cell Assemblies) of Scale



Troughing Idlers-



4.1 Idler Types

Precision Idlers

Scale Quality Idlers look identical to standard Idlers. But, they are manufactured with concentric rollers, precision trough angles, and higher quality bearings to eliminate the effect of mechanical inconsistency.



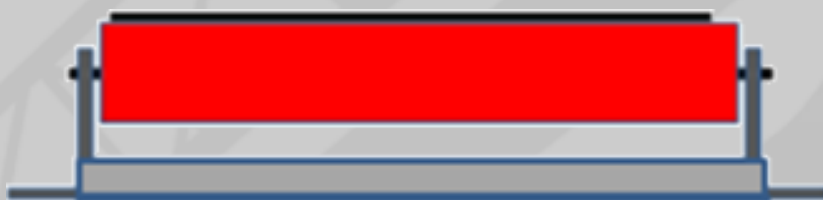
Belt Tracking Idlers

Aids in belt alignment. NOTE: These idlers should not be mounted within 20 feet from the weighing area.



V-Shaped Idlers

Rigidity of the belt is increased, increasing the margin of error.

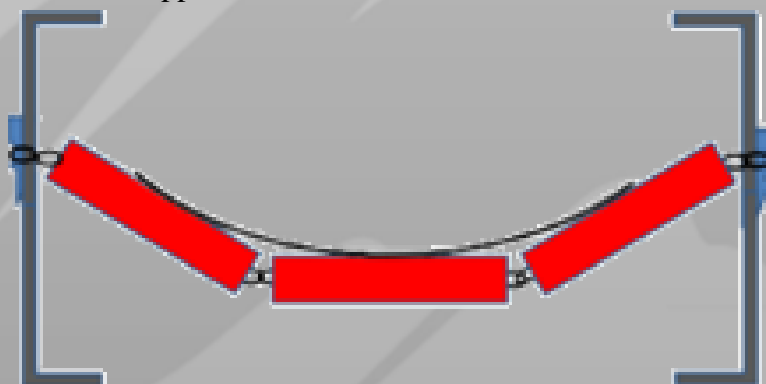


Flat Idlers

Frequently used on weighbelt feeders. Flat belts lack the rigidity of troughed belts, therefore are excellent for high accuracy applications.

Catenary Idlers

Weighing Elements are attached to each end of the roller assembly measuring the tension on the idler rather than direct gravimetric force of the material.



4.2 Conveyor Belting

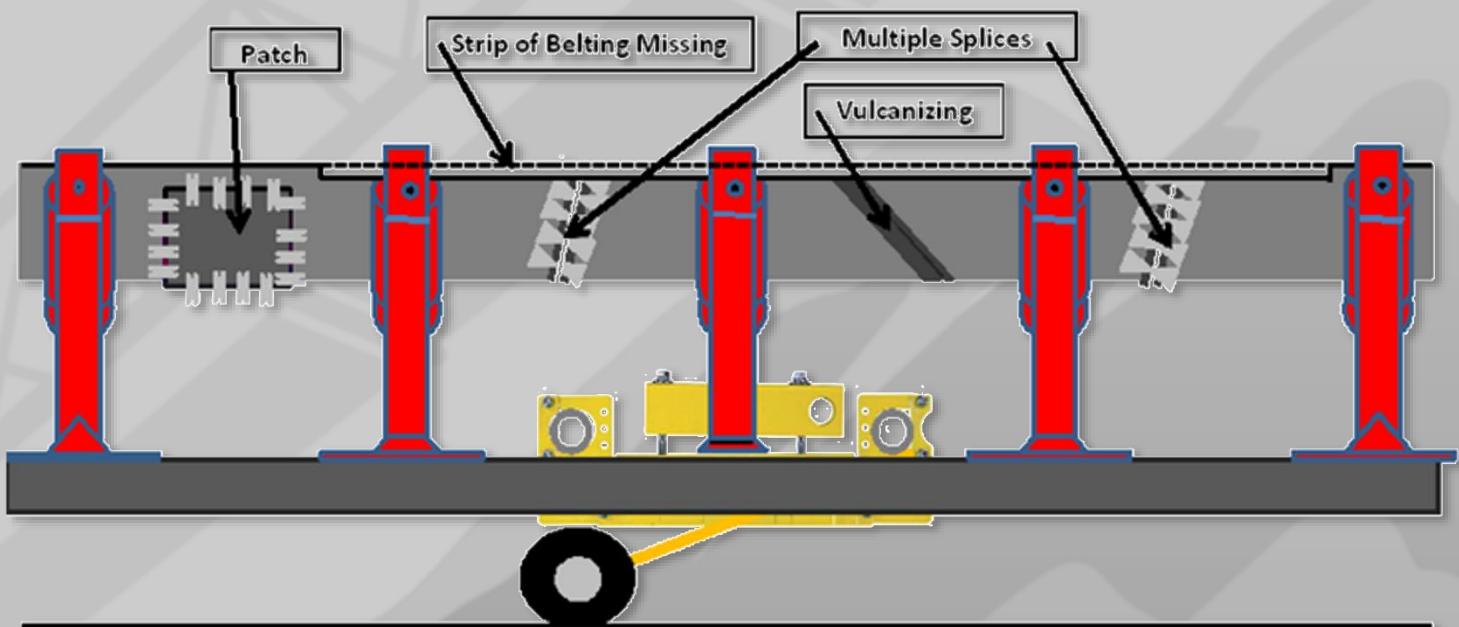
Conveyor belting is available in a variety of thicknesses and grades. It is typically joined together with saddle clips or is vulcanized. The clips are made from steel. Vulcanizing is a melted or glued joint. Some conveyors have multiple splices.

Potential Belting conditions:

- Multiple belt splices and bad patch repairs.
- Patches or saddles that are from different thickness belting.
- Damaged belting with sections missing off the edge.

Potential Scale Issues are:

- Increased mechanical inconsistency resulting in high vibration in the weigh area
- Material loss from the belt due to holes or inconsistent belt edge
- Damaged mechanical splices may cause impact shock on the scale idler.



4.3 Tail Pulley

The tail pulley is the pulley at the start of the conveyor. This is usually the pulley at the point where the material is fed onto the belt.

Potential tail pulley Issues:

- Tail pulley misalignment causes bad belt tracking which may result in uneven belt loading.
- Excessively worn pulley may result in slippage.

4.4 Head Pulley

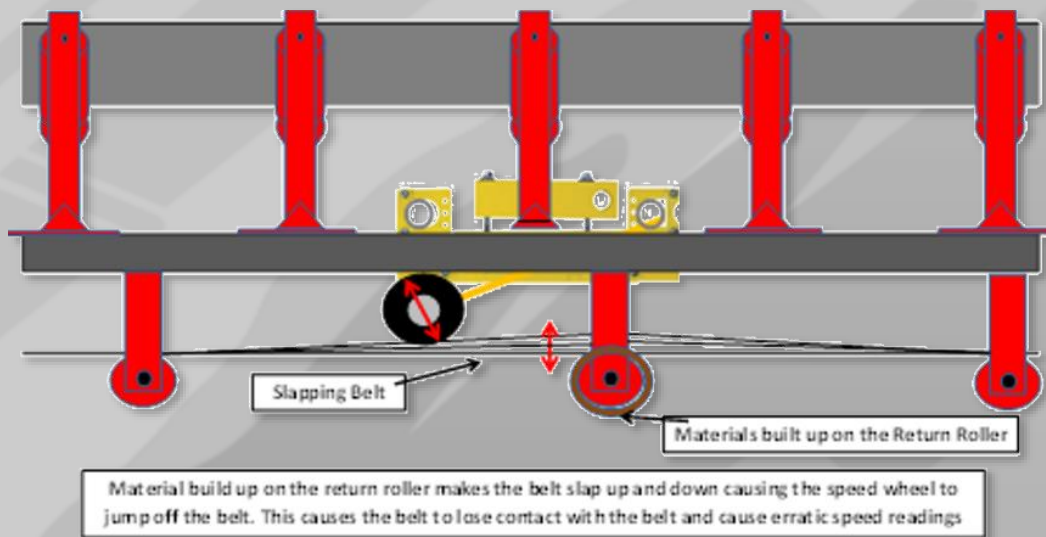
The head pulley is located at the top of the conveyor where material is discharged.

Potential head pulley issues:

- Bearing problems that can cause belt tracking issues.

4.5 Return Idler (just 1 Flat Roller)

The return rollers are mounted on the underside of the conveyor frame to support the return belt. These rollers should be kept free of material build-up, which may result in increased vibration. If the return idlers cause the speed sensor to hop off of the belt, move the mounting arm to the other pipe, or mount the speed sensor on a separate 1-1/4" galvanized schedule 40 pipe anchored to the conveyor frame with standard U-Bolts.



4.6 Belt Tensioners

1. Gravity Take-Up Pulley System

The gravity take up pulley system is a gravity type tensioning device. It typically consists of 3 pulleys and a weight.

2. Manual Tension Adjusters

These adjusters are mounted and incorporated as part of the conveyor frame. There are 2 tensioners - 1 on each side of the conveyor located at the Tail Pulley.

These adjusters do a couple things:

- They adjust the tension of the belt by adjusting the tail pulley forwards or backwards.
- Because they adjust independently they can be used to correct belt tracking problems.

Potential Belt Tensioner's Conditions and issues are:

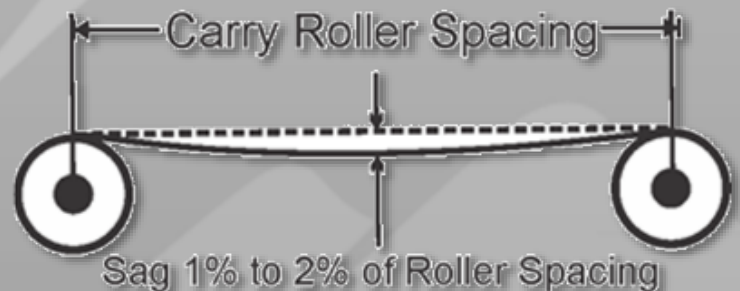
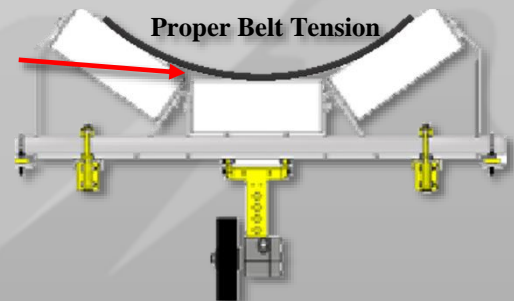
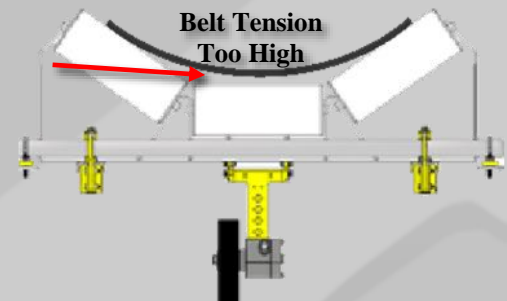
Belt tension is critical because it is related to how the load flows across the belt.

- If the tensioner's are not adjusted evenly the belt will not track correctly.

Belt Tension Issues:

- If too high, the belt will be too stiff and the scale will not sense the load correctly.
- If too loose, the conveyor belt may slip and not be able to carry the load.

Note: Proper Belt Tension results in sag between carry rollers of 1% to 2% of spacing. For example Idler spacing of 48" center to center produces belt deflection of approximately ½" to 1".



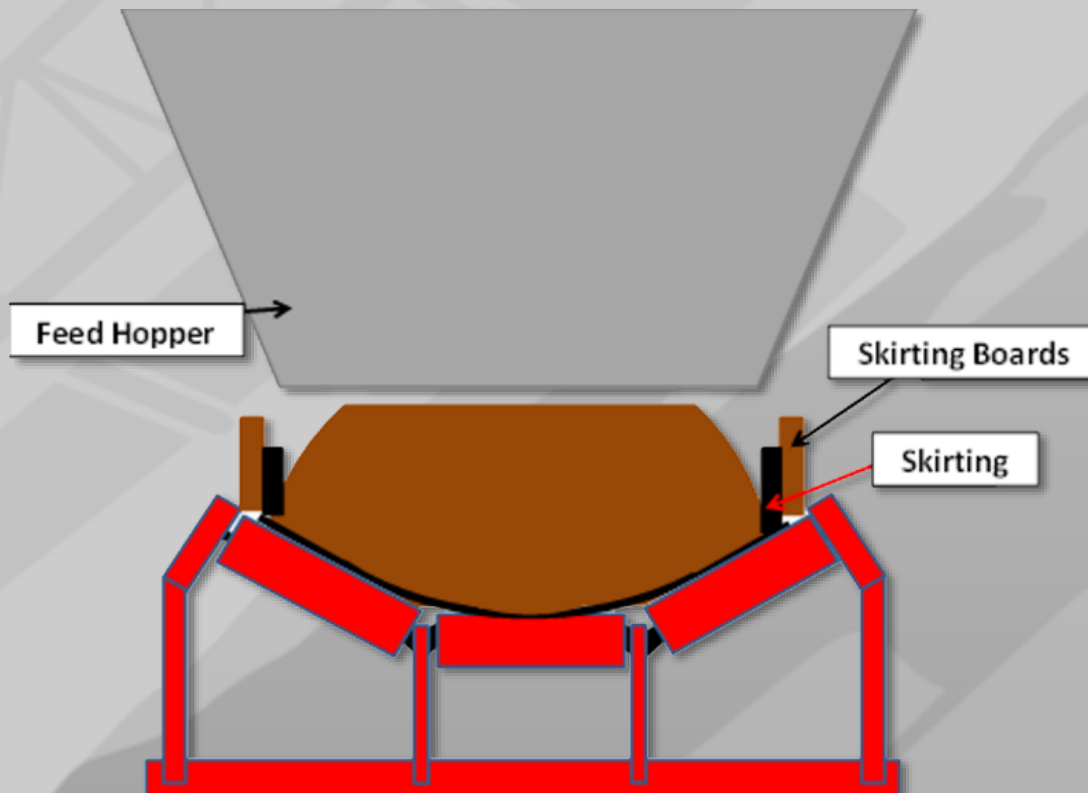
4.7 Skirting Boards and Skirting

- **Skirting Boards**: are placed on both sides of the belt at the point where material is fed onto the belt. They help guide and stabilize the loaded material as it starts its journey up the conveyor belt.
- **Skirting**: Pieces of rubber material that are attached to the Skirting Boards and mounted in such a way that they barely touch the top of the conveyor belting to prevent material spillage at the loading point.

Skirting Boards & Skirting issues:

Skirting Boards: Great for loading the belt and stabilizing material.

Skirting: Incorrectly installed skirting can press on the belt, and the scale will sense this additional pressure, and assume it is material and restrict its movement. If it is too loose, it can allow material to be jammed between the skirting and the conveyor belt causing the same affects as if it were too tight.



Material Belt loading issues

Any scale works best when it is measuring material at 30-60% of its rated capacity. If the material is being trickled onto the conveyor, the scale will not have enough deflection to calculate the weight correctly. The same goes for if the material is loaded more onto one side versus the other.

If you have loading concerns or questions please contact us.

4.8 Impact Rollers (Belt Loading Zone)

The Belt Loading Zone is where material is loaded onto the belt. Impact rollers are mounted and very close together to help absorb the impact from material hitting the conveyor belt. This helps to stabilize material and prevents damage to belting. Weighing accuracy is improved, as impact rollers reduce deflection of the belt due to material impact.

4.9 Other

- **Belt Scrapers**

Belt scrapers keep the belt clean, which in turn prevents material build up on the return rollers.

- **Conveyor Stability issues**

The stability of the conveyor is very important. A conveyor that is under designed for the application is more susceptible to flexing and vibration, which will affect the scale's mechanical alignment and accuracy.

- **Vibration issues**

Excessive vibration on the conveyor can affect the alignment of scale and in extreme cases cause noise interference.

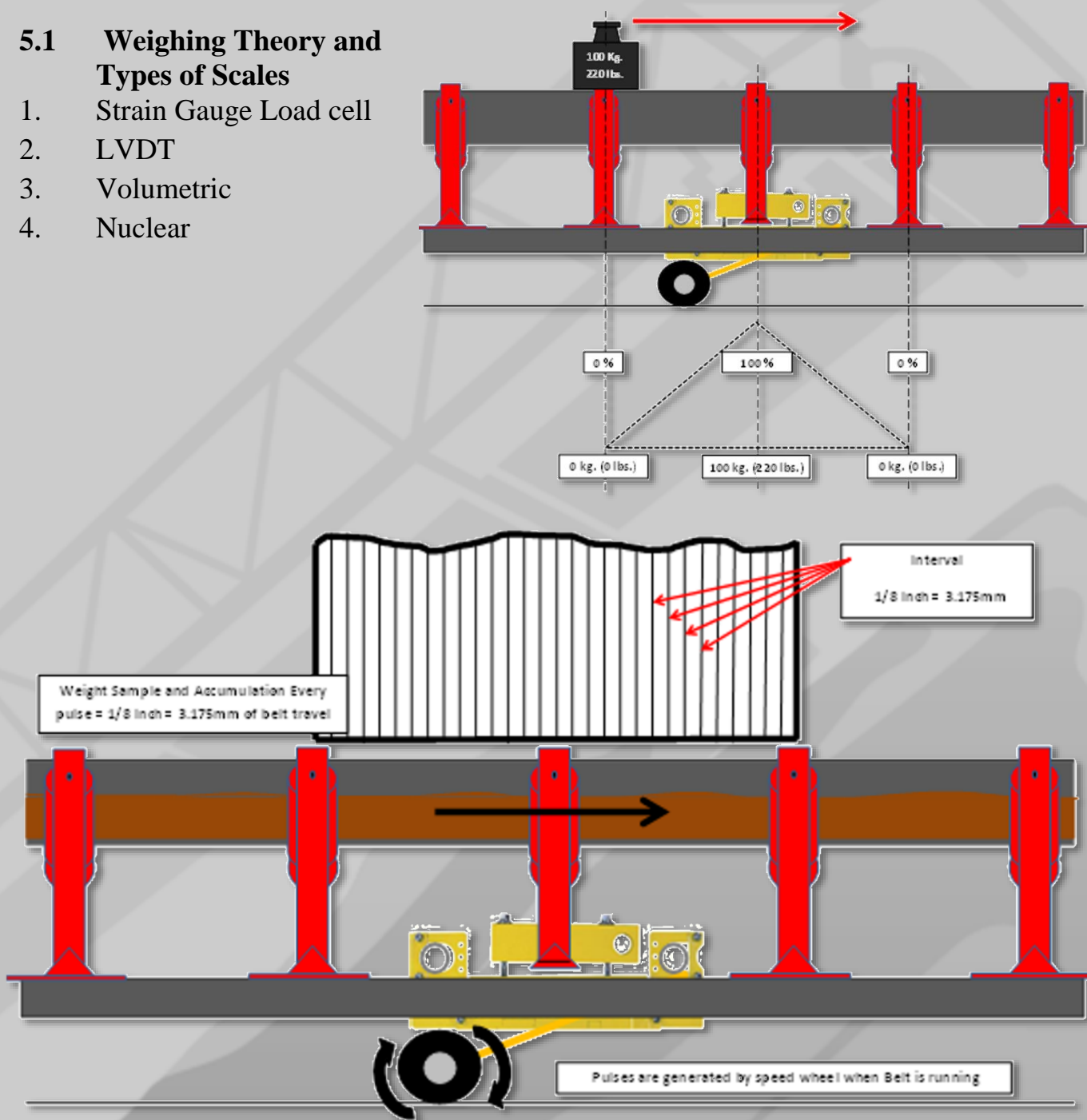
- **Wind**

Wind is a common problem on Conveyors with very light material and loading. In situations like these it is best to install guarding on the conveyor.

5. Basic Weighing Principles and Scale Operation

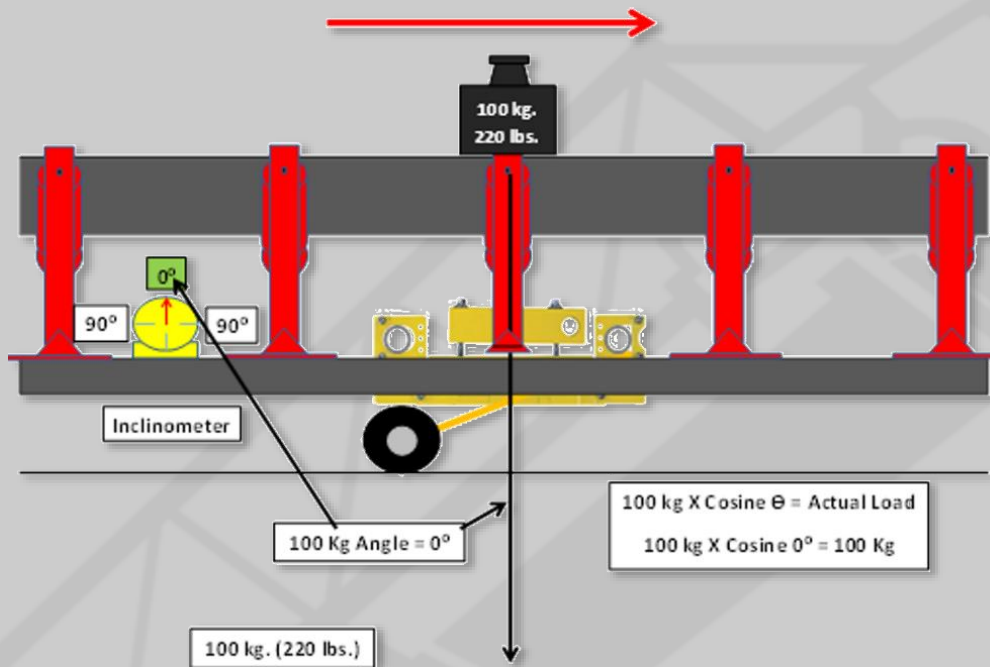
5.1 Weighing Theory and Types of Scales

1. Strain Gauge Load cell
2. LVDT
3. Volumetric
4. Nuclear

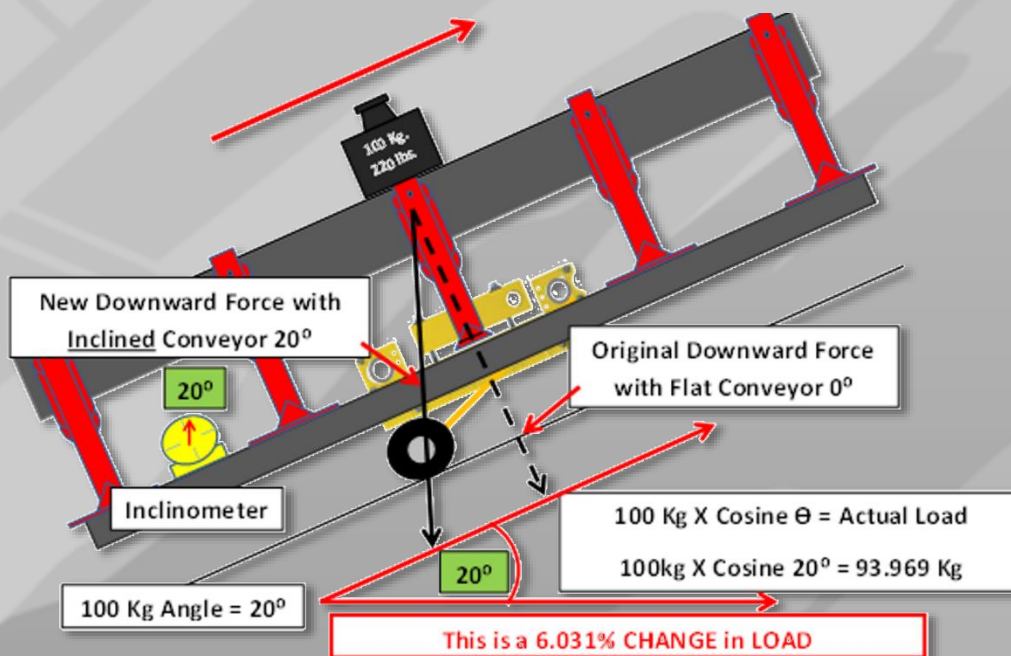




Conveyor Angle of 0°



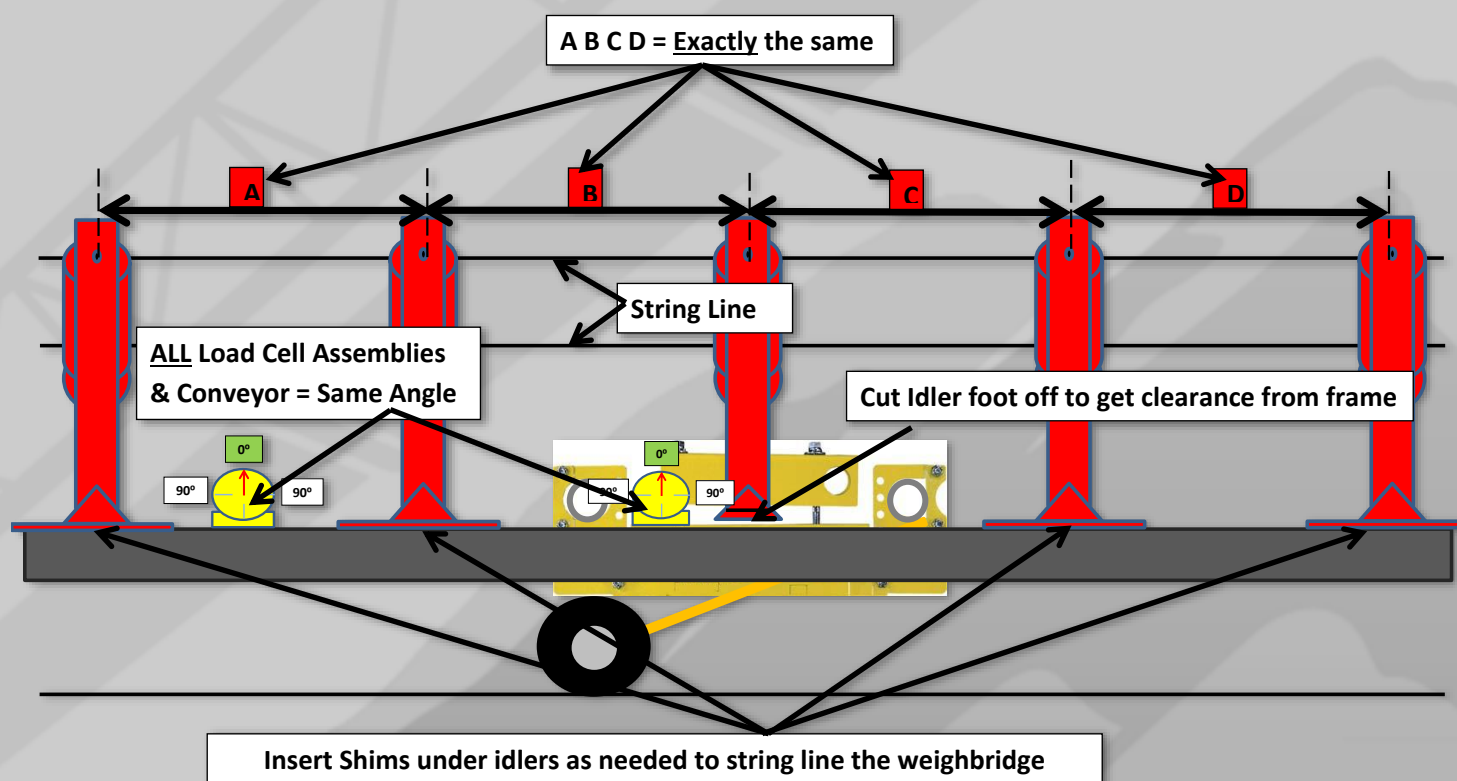
Conveyor with angle of 20°



5.2 Weighbridge - Critical Items to be done with 100% accuracy:

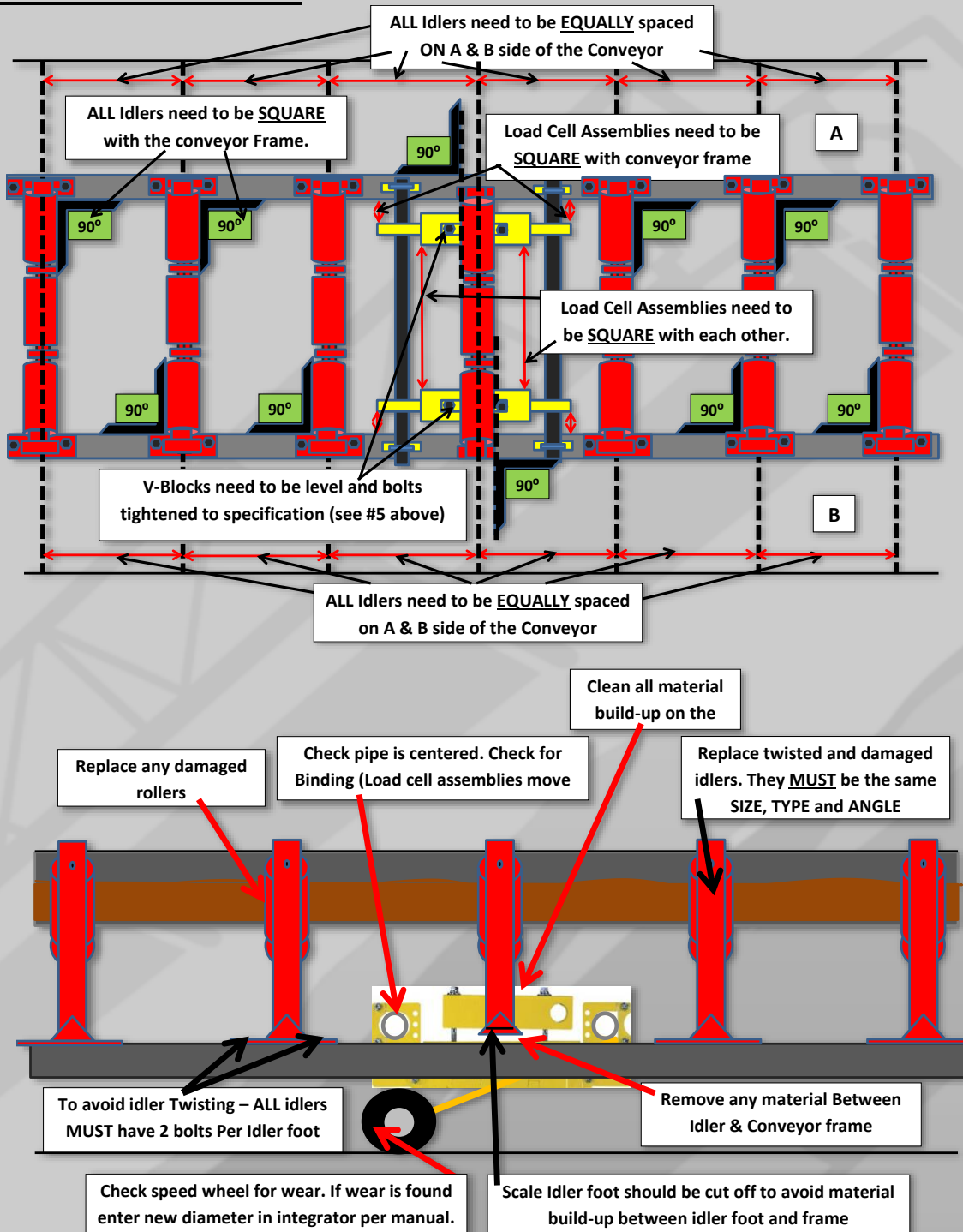
1. The idlers & Rollers in the weighbridge must be in excellent condition.
2. The idlers must be square with the conveyor frame.
3. The idlers must be string lined and shimmed.
4. Tighten the V-block bolts until the split, lock washer, is compressed flat.
DO NOT over tighten. Load cell readings can be affected if over 11 ft lb.
5. The angle sensor must be mounted on the conveyor frame.
6. The pipes MUST be centered on the holes on the load cell assemblies.
7. All MEASUREMENTS must be EXACT. DO NOT GUESS OR ASSUME MEASUREMENTS

CRITICAL WEGHBRIDGE POINTS = 100% ACCURACY REQUIRED





5.2 General Maintenance



General Maintenance Check list

<u>Maintenance Item</u>	<u>Task</u>	<u>Daily</u>	<u>Weekly</u>	<u>Monthly</u>	<u>As Needed</u>
<u>Weighbridge</u>					
Scale + 2 on each side.	Idlers must be in perfect condition. Replace if needed.	X			
Scale Idler	Free of debris between idler and conveyor frame.	X			
Scale Frame	Make sure there is no material obstructing the load cells. Center Pipes in hanger brackets on ends of load cell assemblies.	X			
String Line	Verify all idler rollers are string-lined within +/- 1/16 th “, allowing the empty belt to rest uniformly across the top of the rollers.			X	
Return Rollers	Return rollers must be in good condition and free of material build-up.	X			
Scale Speed Wheel	Wheel must turn easily and be free of wear or flat spots.	X	X	X	
Belt Condition	Make sure belt is in good condition and repair or replace as needed.			X	
Belt Tension	Verify belt tension is NOT too tight or Loose.	X		X	
Belt Tracking	Make sure belt tracking is good, especially across the weighbridge area.	X			
Check Scale Parameters Unique to Your Conveyor	Press ENTER / SCALE SETUP / and confirm all data and dimensions unique to your conveyor are correct.			X	
Zero Calibration	Conduct a ZERO Calibration	X			
Span Calibration	Conduct a Span Calibration			X	X
Material Test	Conduct a Material Calibration test and Adjust.			X	X

6. Conveyor Types and Scale Function

Curved Conveyors with a Vertical Curve

This type of conveyor is **NOT** ideal or recommended for a scale installation.

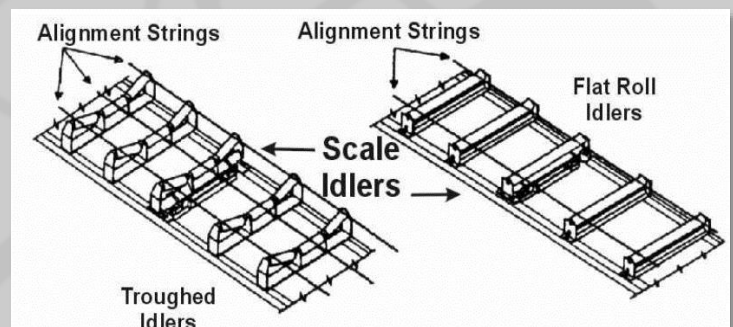
You must check for proper belt and idler contact under the following conditions before deciding to install the scale on this type of conveyor.

1. Conveyor STOPPED – NO Material
2. Conveyor RUNNING – NO Material
3. Conveyor RUNNING – WITH

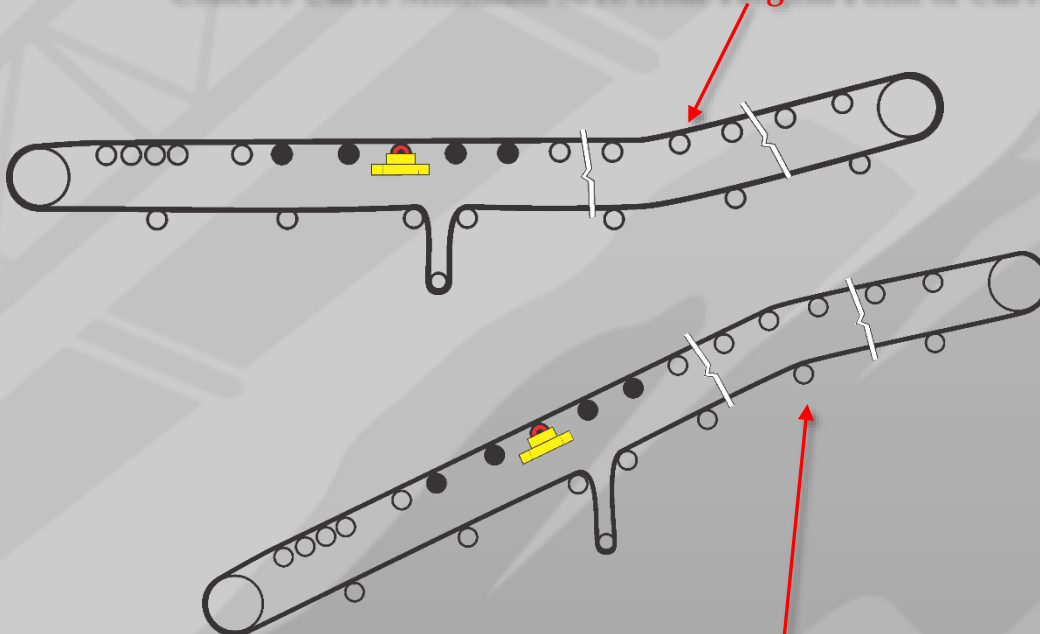
Material

Items to check:

- A. Belt contact in weighing zone
(minimum of 2 idlers before and 2 idlers after the scale).
- B. Belt Tracking.

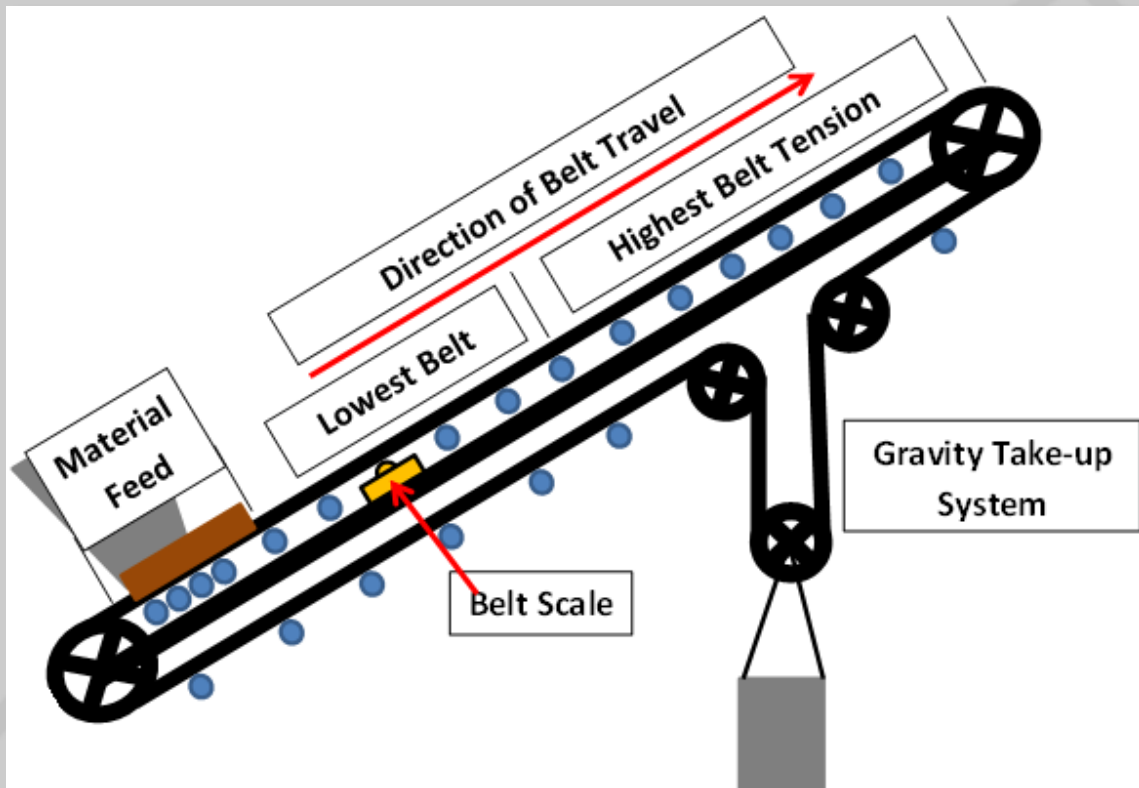


Concave Curve Minimum 30 ft. from Tangent Point of Curve.



Concave Curve Minimum 30 ft. from Tangent Point of Curve.

6.1 Fixed Conveyors



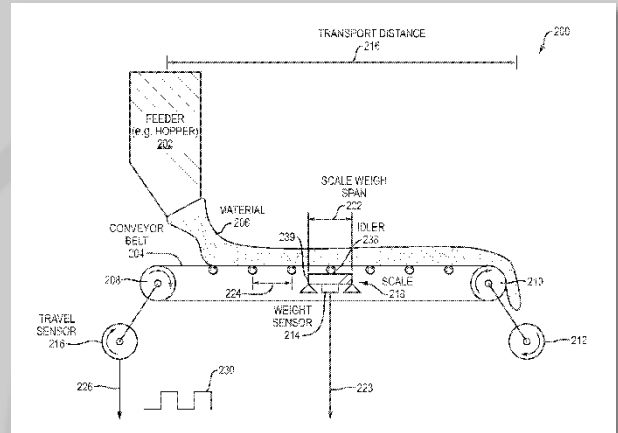
6.2 Radial Stacker Conveyors require an Automatic Angle Compensator to eliminate the need for re-calibration when changing the angle of elevation of the conveyor Fixed Conveyors



Radial Stackers

6.3 Belt Feeders

These belts travel at a very slow speed and the idlers are very close together.



6.4 Portable Conveyors

These Conveyors are moved from time to time as jobs require.



6.5 Mobile Crushing and Screening

Calibrations are done more frequently on these machines because they move regularly in a single day



6.6 Portable Trans-loaders

Used to transfer material from a truck to a railcar, or vise-versa.
Angle compensation required.
Frequent empty belt calibrations are recommended.





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