ASHWORTH ENGINEERING

Committed to on-time delivery of defect-free products and services, fit for use, exactly as promised, every time.

PRODUCT TECHNICAL BULLETIN

SUPER SMALL RADIUS OMNI-GRID®

Turn Radius = 0.8 x (the Belt Width)
(Patent Pending)

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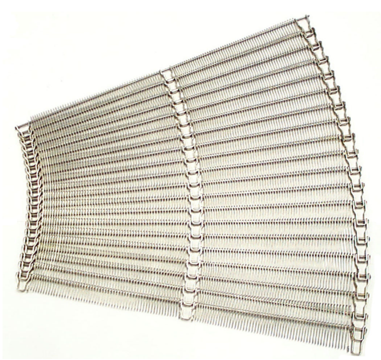
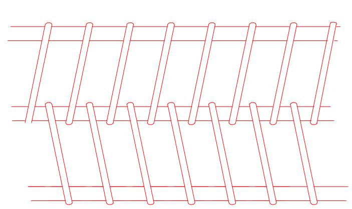


DEFINING CHARACTERISTICS

- **Turn Ratio:** 0.8 to 1
- **Minimum Inside Turn Radius:** (0.8)(Belt Width)
- **Longitudinal Pitch:** 1.08 in [27.4 mm]
- **Turn Capability:** Capable of turning either right or left
- **Standard Belt Widths:** 12 inches [305 mm] through 48 inches [1219 mm]
- **Maximum Allowable Tension:** 150 lbs [667 N] entering and exiting a turn
- **Conveying Surface:** 3.69 inches [93.7 mm] less than nominal width
- **Method of Drive:** Sprocket driven on inside and center links only
- **Basic Construction:**
  - ⇒ T304 Stainless Steel Construction
  - ⇒ 6 gauge (.192 in [4.9 mm]) Connector Rod
  - ⇒ Wear Resistant® links
  - ⇒ Heavy Duty Reduced Radius Link, Inside Edge
  - ⇒ Heavy Duty Non-Collapsing Link, Center
  - ⇒ 1-1/2" pitch Link, Outside Edge, Belt's manufactured prior to August 2005 had a 1-3/4" pitch link. Current production will not splice into older production.
  - ⇒ Center link divides conveying surface into two product lanes.
  - ⇒ Omni-Tough® Spring Wire Mesh for Overlay

BELT SPECIFICATIONS

OMNI-TOUGH® SPRING WIRE MESH OVERLAYS AVAILABLE

Overlay Type	Mesh Designation	Minimum Belt Width in [mm]	Maximum Belt Width in [mm]
BALANCED WEAVE	B24-12/12-16	20 [508]	48 [1219]
	B30-12/12-16	20 [508]	48 [1219]
	B36-12/12-16	20 [508]	48 [1219]
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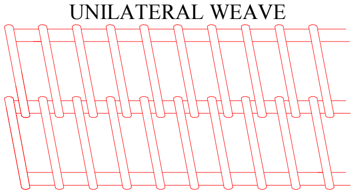
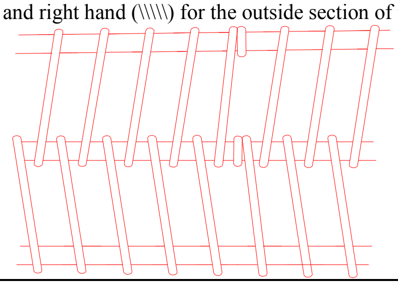
	B30-12/12-17	20 [508]	48 [1219]
	B36-12/12-17	20 [508]	48 [1219]
	B42-12/12-17	28 [711]	48 [1219]
UNILATERAL WEAVE	U36-12/12-16	20 [508]	48 [1219]
	U42-12/12-16	28 [711]	48 [1219]
	U48-12/12-16	32 [813]	48 [1219]
	U36-12/12-17	20 [508]	48 [1219]
	U42-12/12-17	28 [711]	48 [1219]
	U48-12/12-17	32 [813]	48 [1219]
	U54-12/12-17	32 [813]	48 [1219]

MESH OVERLAY:
Designation:
B X-Y-Z and U X-Y-Z
First Digit: B = Balanced Weave; U = Unilateral Weave
X: First Number: No. of Loops per Foot of Width
Y: Second Number(s): No. of Spirals per Foot of Length (12 for 1in. pitch)
Z: Third Number: Wire Gauge
Examples:
B30-12-17
U42-12-16

Sizes: 14 through 18 ga. (.080 in. [2.0 mm]) through .048 in. [1.2 mm] diameter) **Material:** annealed or high tensile spring wire (Omni-Tough®)

NOTES:

- The first set of numbers in the mesh designation indicates the number of spiral loops per foot of width.
- The second number specifies the number of pitches per linear foot. Since the inside mesh section and the outside mesh section each have 12 pitches per linear foot [305 mm] of belt and are combined on the same belt, we express this middle number as 12/12.
- The last number is the wire gauge of the mesh.
- Spirals in mesh overlay for the outside section of this belt are tapered, starting at 1.08 in [27.4 mm] pitch and increasing to a nominal 1.50 in [38 mm] pitch
- Spirals for unilateral mesh overlays are woven left hand (/////) for the inside section and right hand (\\\\\) for the outside section of the belt.
- **Internal Pigtails -** secure the rod position within the overlay spirals, which is particularly helpful for applications with a soft or wet product. Internal pigtails may be manufactured into any Omni-Tough tapered spiral overlay.



BELT WEIGHT

Overlay Weights

Mesh Lateral Count	18 ga .0475 in. [*1.2 mm*]		17 ga .054 in. [*1.4 mm*]		16 ga .0625 in. [*1.6 mm*]		14 ga .080 in. [*2.0 mm*]	
	lbs/ft²	*kgs/m²*	lbs/ft²	*kgs/m²*	lbs/ft²	*kgs/m²*	lbs/ft²	*kgs/m²*
12	.22	*1.1*	.29	*1.4*	.38	*1.9*	.64	*3.1*
18	.31	*1.5*	.42	*2.1*	.55	*2.7*	.94	*4.6*
24	.41	*2.0*	.56	*2.7*	.74	*3.6*	1.23	*6.0*
30	.51	*2.5*	.68	*3.3*	.93	*4.5*	1.54	*7.5*
36	.61	*3.0*	.82	*4.0*	1.08	*5.3*	1.84	*9.0*
42	.71	*3.5*	.95	*4.6*	1.26	*6.2*	2.14	*10.5*
48	.82	*4.0*	1.08	*5.3*	1.44	*7.0*	2.44	*11.9*
60	1.02	*5.0*	1.35	*6.6*	1.80	*8.8*	3.05	*14.9*

OMNI-GRID BELT DATA

BELT WIDTH		INSIDE TURN RADIUS		BELT BASE WEIGHT	
in.	*mm*	in.	*mm*	lbs/ft	*kgs/m*
12	305	9.6	244	2.46	3.7
14	356	11.2	284	2.64	3.9
16	406	12.8	325	2.82	4.2
18	457	14.4	366	3.00	4.5
20	508	16.0	406	3.18	4.7
22	559	17.6	447	3.37	5.0
24	610	19.2	488	3.55	5.3
26	660	20.8	528	3.73	5.6
28	711	22.4	569	3.91	5.8
30	762	24.0	610	4.09	6.1
32	813	25.6	650	4.28	6.4
34	864	27.2	691	4.46	6.6
36	914	28.8	732	4.64	6.9
38	965	30.4	772	4.82	7.2
40	1016	32.0	813	5.01	7.5
42	1067	33.6	853	5.19	7.7
44	1118	35.2	894	5.37	8.0
46	1168	36.8	935	5.55	8.3
48	1219	38.4	975	5.73	8.5

Consult out Product Engineers for approval of wider belt widths and concerns regarding belt tension or turn ratio.

Calculating total belt weight:

Conveying Surface = belt width – 2.60 inches [66 mm]

Belt Weight = (Weight of Base Belt) + (Weight of Mesh Overlay)

- Calculate in units of weight per unit length – lbs/feet or kgs/meter.
- Determine weight of base belt from chart at left
- If belt has a mesh overlay, Calculate Conveying Surface of Inside Section and Conveying Surface of Outside Section.

Convert to units of feet or meters.

- If applicable, determine weight of mesh on inside section and weight of mesh on outside section see mesh chart under standard options.
- Sum the above weights to obtain the total belt weight.
- Multiply calculated value by belt length for total belt weight.

Sample Calculation:

For a 36” wide belt with center link position at 18” and an overlay of B36-12/12-16 (reference above calculations for conveying surface),

Belt Weight = 4.64 lbs/ft + (16.117 in)(1 ft/12 in)(1.12 lbs/sq.ft)
+ (16.195 in)(1 ft/12 in)(1.49 lbs/sq. ft)

Belt Weight = 8.16 lbs/ft.

BELT OPTIONS

OMNI-TOUGH®

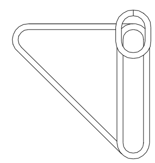
- Provides a flatter mesh surface with a high resilience to impact.
- Available for most belt widths in most mesh configurations. Available in 16 and 17 ga. only.

VARIABLE LOOP COUNT
(Patent No. 6,129,205)

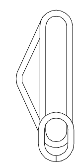
- When belt collapses on inside edge to accommodate a turn, product support is maximized and wire overlay does not overlap.
- Mesh count is more open on the inside belt edge and progressively gets tighter across the width of the belt.
- Available in Omni-Tough® only
- Turn direction must be specified.
- Mesh designated as follows: B42/24-12-17 where belt has an inside mesh of 24 progressing to 42 spirals/foot.

SPECIAL SPIRALS

- Available in Omni-Tough® only
- One or more spirals on conveying surface is raised
- Used as guard edges, lane dividers and flights
- Maximum height equal to belt pitch
- Available Options: height, spacing, location, shape and number of lanes in belt.



Right Triangle



Isosceles Triangle

SPROCKETS

Standard UHMW sprockets for 1.08 inch pitch belts.

No. of Teeth	Overall Diameter		Pitch Diameter		Flange Diameter		Flange Width		Hub Width		Hub Diameter & Type		Bore Minimum		Bore Maximum	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	Mm
9	3.53	89.7	3.16	80.2	--	--	--	--	2.00	51.0	2.53	64.3	.813	20.6	1.44	36.5
13	4.90	124.5	4.53	115.1	--	--	--	--	2.00	50.8	3.90	99.1	1.00	25.4	2.19	55.6
18	6.65	168.9	6.24	158.5	--	--	--	--	2.00	50.8	5.65	143.5	1.00	25.4	3.75	95.3
23	8.39	213.0	7.96	202.2	--	--	--	--	2.00	50.8	7.39	187.6	1.00	25.4	4.00	101.6
31	11.16	283.5	10.72	272.3	--	--	--	--	2.00	50.8	101.6	258.1	1.00	25.4	7.13	183.0
37	13.24	336.2	12.73	323.5	--	--	--	--	2.00	50.8	12.24	310.8	1.00	25.4	8.94	277.0

Steel sprockets for 1.08 inch pitch belts.

No. of Teeth	Overall Diameter		Pitch Diameter		Flange Diameter		Flange Width		Hub Width		Hub Diameter & Type		Bore Minimum		Bore Maximum	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	Mm
13	4.80	124.5	4.53	115.1	--	--	--	--	2.00	51.0	3.90	99.1	1.00	25.4	2.19	55.6

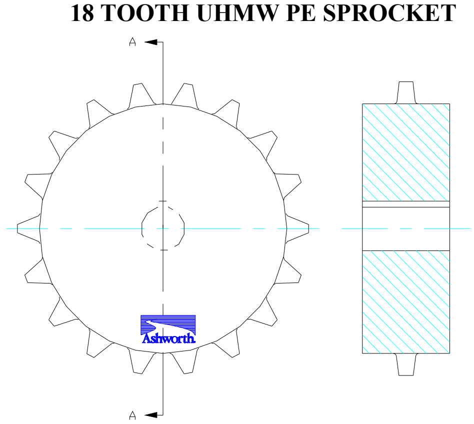
NOTES:

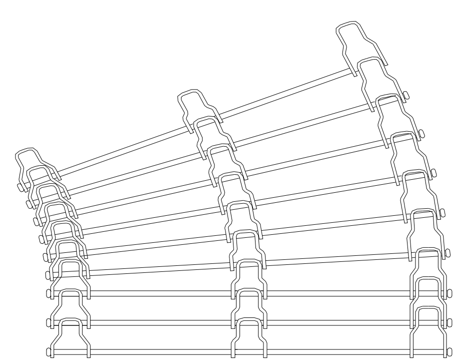
- UHMWPE material type components have a 150°F [66°C] maximum operating temperature.
- Maximum bore sizes listed for UHMWPE material is based on 1/2 inch [12.7 mm] of material above keyway.

SUPPORT

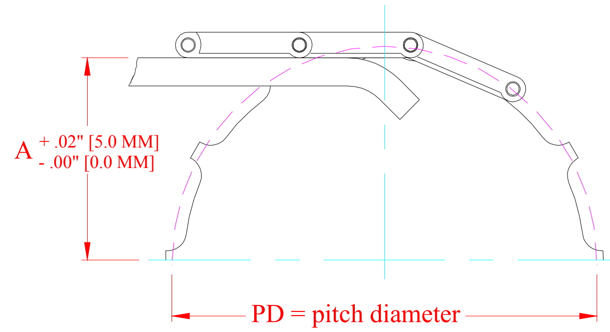
Supports are required on a maximum of 6 inches apart on load side and 12 inches maximum on return side. Rollers may also be used.
NOTE: For heavier load applications, additional support rollers may be required.

18 TOOTH UHMW PE SPROCKET





WEARSTRIP PLACEMENT



A = ½ X PD – 0. 50 inch [12.7 mm]

- This is only a guideline; it does not take into account the influence of speed.
- At speeds above 75 ft/min [23 m/min], Ashworth recommends increasing the distance A and shortening the wear strips as much as one belt pitch in length. (Nominal Belt Pitch = 1.08 inches [27.4 mm])

ENGINEERING CALCULATIONS

Coefficient of Friction	Type of Support Structure
.15	Nylon-12 under overlay (unlubricated)
.15	Acetal under overlay (unlubricated)
.10	Acetal under overlay (lubricated)
.15	Steel support rails (lubricated)
.20	Steel support rails (unlubricated)
.20	UHMW under links (unlubricated)

- **Inside Turn Radius** - turn radius measured to the inside edge of the belt
- **Turn Ratio** - ratio of inside turn radius to the belt width. For this belt: 0.8 to 1.
- **Center Link Position** - distance between inside edge of belt and centerline of center link.
- **In order to accommodate a turn,** the inside row of links collapses while the outside row expands. The center link carries the full belt tension. Maximum allowable tension is 150 lbs. [667 N].
- **In a straight run condition,** the inside and center rows of links are under tension. Maximum allowable tension is 300 lbs. [1334 N].

TURN RATIO

Turn Ratio = ITR ÷ BW

where ITR = Inside Turn Radius
BW = Belt Width

Turn Ratio is dimensionless. Inside Turn Radius and Belt Width must both be in same unit of measure.

Sample Calculation:

For Inside Turn Radius = 28.8”, Belt Width = 36”

Turn Ratio = 28.8” ÷ 36” = 0.8

CENTER LINK POSITION

Center Link Position = ITR (inches) ÷ 1.6

Calculate Center Link Position in units of inches and convert to millimeters if necessary.

Sample Calculation:

For Inside Turn Radius = 28.8”, Belt Width = 36”

Center Link Position = 28.8” ÷ 1.6 = 18”

BELT LENGTH

Belt Length calculation will depend on system layout. In calculating belt length for Super Small Radius Omni-Grid, use the radius to the middle of the center row of links.

CONVEYING SURFACE

Total Conveying Surface = Belt Width – 3.688”
or, = Belt Width – 93.68 mm

Conveying Surface of Inside Section =
Center Link Position – 1.883”
or, Center Link Position – 47.83 mm

Conveying Surface of Outside Section =
(Belt Width – Center Link Position) – 1.805”
or, (Belt Width – Center Link Position) – 45.85 mm

Sample Calculation:

For a 36” wide belt, Center Link Position = 18”

Total Conveying Surface = (36” – 3.688”) = 33.312”

Conveying Surface of
Inside Section = (18” – 1.883”) = 16.117”
Outside Section = (36 – 18)” – 1.805” = 16.195”

BELT TENSION

Estimated belt tension in a straight run:

$$T = [wLf_r + WLf_l + WH] \times C$$

Where:

- **T** = Belt Tension in pounds force (Newtons)
- **w** = Weight of belt in pounds per linear foot (kilograms per linear meter)
- **L** = Length of conveyor – center to center of terminals – in feet (meters)
- f_r = friction factor between belt and support rails, return side
- **W** = weight of belt AND payload in pounds per linear foot (kilograms per linear meter)
- f_l = friction factor between belt and support rails, load side
- **H** = rise of an incline conveyor (+ if incline; - if decline) in feet (meters)
- **C** = Conversion factor – Imperial 1.0; Metric 9.8

FRICTION FACTORS for Stainless Belt on UHMW Rails	
Friction Factor	Type of Product
0.20	clean, packaged
0.27	breaded, flour based
0.30	greasy, fried at < 32 ºF
0.35	sticky, glazed sugar based

CONVERSION FACTORS	
TO CONVERT:	**MULTIPLY BY:**
inches to meters	0.0254
lbs to kgs	0.4536
lbs/ft to kgs/meter	1.488
lbs/sq. ft. to kgs/sq. m.	4.882
lbs force to Newtons	4.448

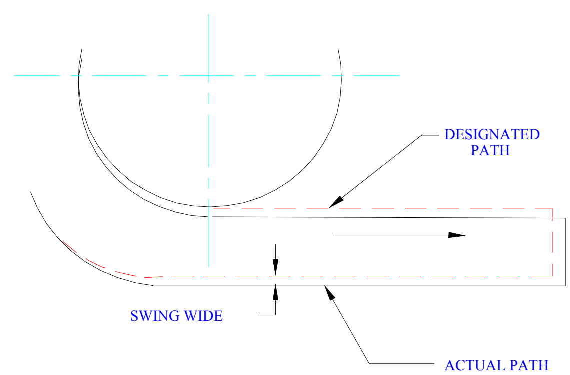
SYSTEM REQUIREMENTS

LUBRICATION

Lubrication with silicone may be necessary on the belt support rails in some cases. The best method of application is by brush, fed from a drip reservoir and brushed onto the bottom in the return so that the belt applies the lubricant to the rails on the load side. Apply lubricant until the take-up rises or the drive amp reading drops to set values determined by testing.
Typically, a customer uses 8 ounces per week on a system employing 1500 feet of belt in a 24 hour a day operation. As you can see, this is a very small amount of oil and dripping should not be a problem.

SWING WIDE

The belt tends to "swing wide" as it exits the spiral cage or turn curve, following a path that is offset but parallel to the normal tangent line to the cage. This phenomena itself does no damage, but often the belt edge contacts framework that does not leave sufficient clearance for this to occur. The usual reaction of the builders or users is to restrict the path of the belt from swinging wide, typically by use of rollers or shoe guides.
Restraining the belt path can have several adverse effects on belt life:



- The belt can wear through a shoe guide, allowing the edge to snag. This will eventually cause an increase in belt tension and damage the belt edge.
- Outside edge restraints can push individual rods inward. The rods can be held in this inward position by belt tension. There is then a potential for the projecting rods to catch on the vertical cage bar capping, causing damage to the belt, damage to the cage bar capping, and high belt tension.
  If the belt is pushed into a straight tangent path, the tension carried in the outside edge of the belt is shifted to the inside edge of the belt. The result is a pronounced tendency for one edge of the belt to lead the other.
- **All Small Radius belts have a tendency to “swing wide”** to the outside at the exit of turns. Two factors are known to cause this:
  1. In a turn, the tension is concentrated in the middle row of links. This stretches this row of links making it longer than the inside edge. This forces the belt into a “banana” shape.
  2. The other cause is permanent elongation due to internal wear of the links.

Solution: Provide extra clearance between the belt and any exterior framework. We suggest about one inch per foot of belt width, or 25 mm per 300 mm of width.

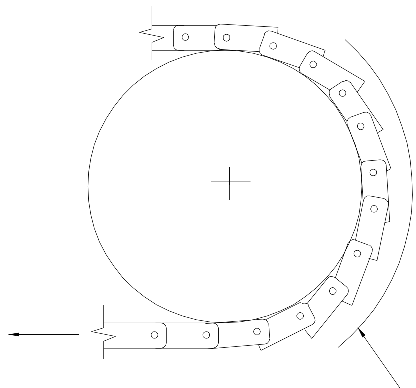
Center Link Positioning:
Center link location is based on turn radius and determined by formula specified previously. Failure to properly position the center row of links will result in an unfavorable operating condition.

- If the center row of links is positioned too close to the inside edge of the belt, the links along the inside edge will tent (/\). The center link position will be too short to collapse to the inside turn radius.
- If the center link is positioned too far from the inside edge there is incomplete collapse of the inside edge. This condition allows excessive movement of the connector rod in the link slot, which may disturb product orientation.

Sprocket drive:
Locate sprockets only in the inside and center link rows. Do not set the sprockets in the outside row of links. Use a simple idler roll of a matching flange diameter under the outside row of links.

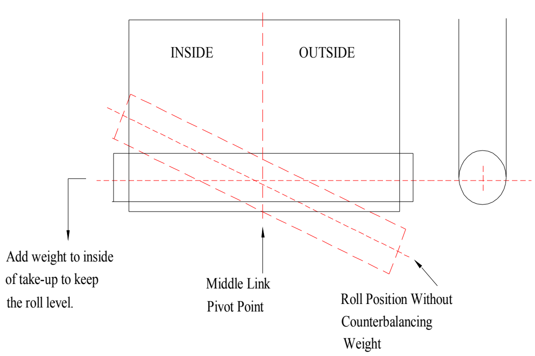
Transfers:
Because the outside section has a longer pitch than the inside section and the links in the outside row are in a collapsed position in straight runs, the forward corners of the links protrude above the belt surface at the terminals.

- **To provide a close transfer for the product to the adjacent equipment**, modify the transfer plate or blade in the area of the outside links to provide adequate clearance.



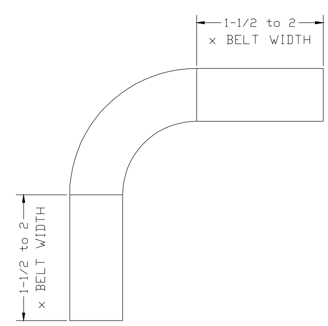
- **Small Radius belts usually will not hang squarely in a take-up loop** because the collapsed outside edge extends due to gravity. The belt will pivot about the center link, causing the inside edge to collapse. This causes the take-up roll to hang at an angle and bind in the take-up frame.

Solution:
To keep the take-up level, add weight to the inside end to counter-balance the weight of the belt's outside section. Use a take-up that exerts minimum force on the belt. For spiral systems, a free-floating take-up system as shown is typical.



- **The inside belt section must be fully extended** before encountering any sprocket teeth. To insure this, provide a straight run of at least 1-1/2 x (Center Link Position) before and after turns.

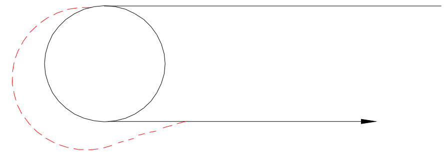
  For speeds of 60 fpm [18 m/min] and greater, increase straight run to at least 2 x (Center Link Position).

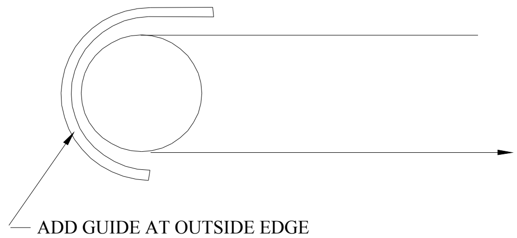


For wider belts at more than modest speeds, typically 60 fpm [18 m/min] and greater, two problems may occur at the terminal ends:

- The outside half of the belt may be affected by centrifugal force, causing it to **flare out**.

  If this occurs, add a guide over the outside edge to limit the flare out.

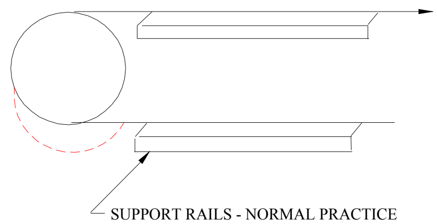




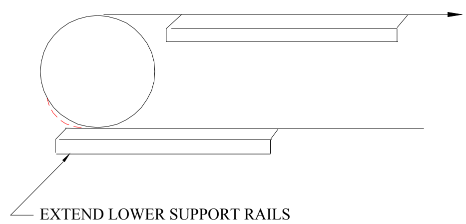
ADD GUIDE AT OUTSIDE EDGE

- In addition, the weight of the outside half of the belt causes the **outside links to droop** at the terminals. While this drooping is not an operating problem, it does not present a good appearance and may interfere with other equipment.

  A simple correction is to extend the return support rails beyond the terminal centerline.



SUPPORT RAILS - NORMAL PRACTICE



EXTEND LOWER SUPPORT RAILS

Reference: *Product Technical Bulletin "Conveyor Design Guidelines".*

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