Here's Information That Will Help You…..

✓Design a New Conveyor System

Plan your complete Overhead Trolley Conveyor System….and select all the basic components to make this system operate effectively.

✓Expand or Improve Your Present System

To meet changing demands….solve operating problems….or make it more efficient.

✓Replace Worn or Malfunctioning Units

As a practical means of reducing maintenance costs or avoiding breakdowns.

Handling Systems and Conveyors ……..always one move ahead!

At HSC, we "custom build" our equipment to meet your specific production needs, utilizing standard structural components and the latest technologies available. Cost-efficient and intelligently engineered overhead components that conform to your changing production needs are the trademark at HSC. We build smart systems from the ground up that can:

- ✓Utilize off the shelf tractor and hoist assemblies from proven manufacturers.
- ✓Interface with robots, local networks and existing production equipment.
- ✓Accommodate multiple load and unload points.
- ✓Assure extraordinary precision to further improve production economics.
- ✓Utilize available plant space in the safest most efficient manner.
- ✓Provide for multiple inspection and assembly stations.
- ✓Increase productivity and enhance product quality at the same time.
- ✓Reduce your down time and maintenance problems.
- ✓Meet the most demanding customer requirements.

Justifying the New or Improved System

Very often an important factor in obtaining approval of a new or improved system is justifying these changes to management. So consider as you plan how these changes can improve production….cut costs….speed workflow….reduce maintenance….or prove other benefits to your operations.

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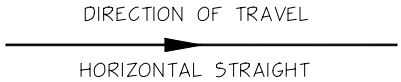
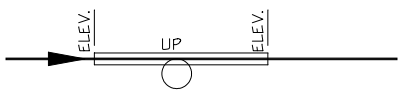
Overhead Trolley Conveyor Symbols

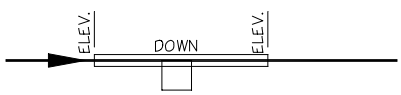


HORIZONTAL STRAIGHT CONVEYOR

VERTICAL CURVE

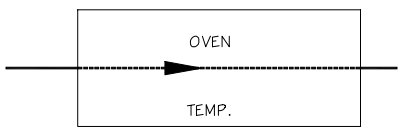


ANTI–BACKUP

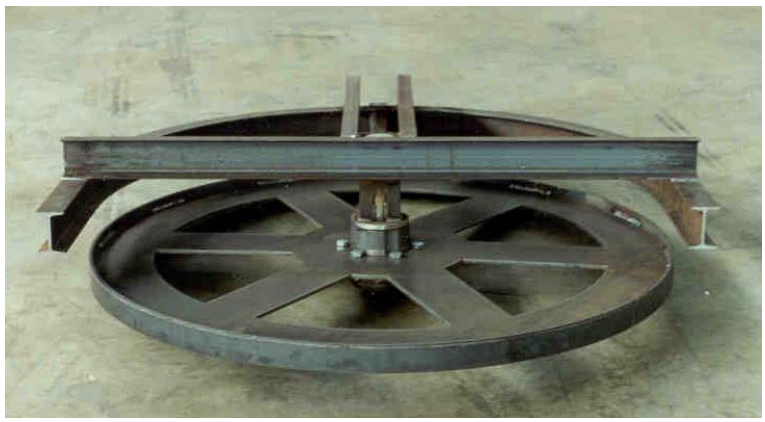


ANTI–RUNAWAY

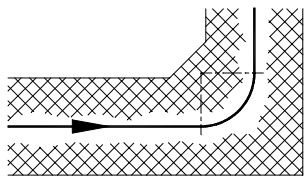
EXPANSION JOINT



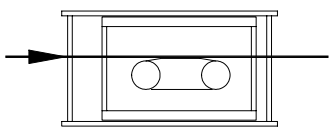
FINISHING EQUIPMENT
OVEN, WASHER, SPRAY BOOTH ETC.



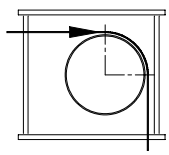
Traction Wheel



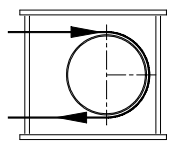
SCREEN GUARD



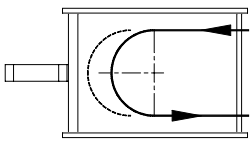
CATERPILLAR DRIVE



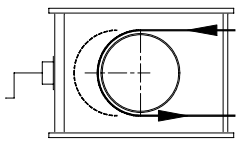
90 DEG. SPROCKET DRIVE



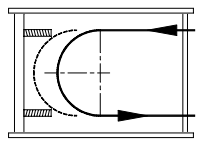
180 DEG. SPROCKET DRIVE



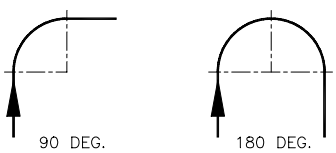
ROLLER TURN TAKE–UP
AIR OPERATED



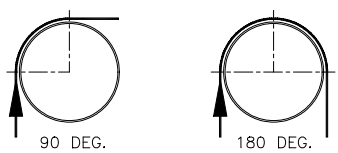
TRACTION WHEEL TAKE–UP
MANUALLY OPERATED



ROLLER TURN TAKE–UP
SPRING OPERATED



ROLLER TURN



TRACTION WHEEL

Definitions for Overhead Trolley Conveyors

Adjustable Speed Drive: A type of drive with a speed-changing device (typically a variable speed pulley) by which the speed of the conveyor can be changed. There are two methods of varying the conveyor speed; one is by mechanical means through a variable speed pulley and an adjustable motor base, the second is electronically. The conveyor speed is adjusted by changing the hertz to the motor. Most motors are at full RPM at 60 hertz. The relationship between hertz to rpm is linear (lowering the hertz will lower the RPM).

Air Operated Take-up: See take-up.

Anti-Backup: A safety device to stop the chain (trolley & product load) from backing up. Typically used on incline verticals to prevent a load(s) from rolling backwards due to chain failure. Anti-backups can be supplied with or without a limit switch. The limit switch is normally wired into an emergency stop circuit.

Anti-Runaway: A safety device to stop the chain (trolley & product load(s)) from running away in the event of an electrical or mechanical failure. Typically used on decline verticals to prevent a load(s) from running away. Anti-runaways can be supplied with or without a limit switch. The limit switch is normally wired into an emergency stop circuit.

Automatic Lubricator: A device used to lubricate the chain, trolley wheels and other conveyor components as they pass. Most automatic lubricators require 115VAC and plant air.

Automatic Take-up: See take-up.

Back-Up Bar: A metal bar (typically an alloy that is heat treated) used to back up the caterpillar chain of a drive to hold the drive chain dogs in proper contact with the conveyor chain.

Back-Up Rollers: A nest of rollers on the caterpillar drive that maintains pressure on the conveyor chain in order to insure proper engagement of the caterpillar chain to the conveyor chain. The back-up rollers and the back-up bar work together to keep the caterpillar chain engaged with the conveyor chain.

Balanced Drives: Conveyor drives designed so that two or more drives can operate on a single chain. The drives should be balanced in chain pull and are designed to share the load requirements.

Bracing: Diagonal or horizontal members used to prevent swaying in the conveyor supporting structure.

Caterpillar Chain: A short roller chain (typically 10 ft. long) with dogs on predetermined centers (depending on conveyor chain size) to mesh with the conveyor chain. The caterpillar chain drives or sometimes is driven by the conveyor chain. The dog centers on a caterpillar chain for a 348 system is 12”; 458 system is 8”; 678 system is 12”. The size of the dogs will vary depending on the conveyor chain size.

Definitions Cont'd.

Caterpillar Chain Dog: A dog or tooth attached to a caterpillar drive chain to provide the driving contact with the conveyor chain.

Caterpillar Drive: See Drive.

Center Link: The loop-shaped link of rivetless chain, which provides the bearing, surfaces for the pins. Trolleys are inserted into the centerlink to support the chain from the rail.

Chain Pin: The pin that is used to connect each link of the chain and is also the pivot surface.

Drive:
Caterpillar Drive: A drive equipped with a caterpillar chain to provide the propelling contact with the conveyor chain.

Sprocket Drive: A conveyor chain driving unit using a sprocket to transmit power to the chain, located at a turn of approximately 90 degrees or greater.

Drive Frame: The structure which supports the drive shaft assembly and machine parts and which contains or supports the motive power or supports the assembly to which the motive power is connected.

Drive Shaft: Main driving shaft on which the conveyor sprocket is mounted.

Drive Sprocket: Sprocket of a caterpillar drive or of a sprocket drive.

Drop: The vertical distance from the bottom of the track to centerline of the chain.

Guard:
Conveyor Guard: A structure mounted below the conveyor path to protect personnel below. Conveyor guarding is required anywhere the bottom of the product is greater than 7'-0" from the floor level.

Machinery Guard: A covering or barricade for safety purposes such as gear, chain and V-belt guards.

Hanger Steel: Angles or rods by which a conveyor is hung from supports above.

Link: A chain unit of one pitch length.

Load Bar: A device used to distribute a load a load over two or more trolleys.

Rivetless Chain: A completely forged, heat treated chain of pins, side links and center links which can be assembled or disassembled without the use of tools.

Roller Turn: A series of vertical rollers mounted in a frame to guide a conveyor chain around a horizontal curve.

Roller Turn Roller: The vertical roller with integral bearings as used in the roller turn.

Side Link: The portion of the chain that longitudinally connects joint portions at each end of the centerlink with chain pins.

Definitions Cont'd.

Superstructure: Members to which the hanger steel is connected and which transfers the load to the building members. Typically described as the columns and main headers to support the conveyor from.

Take-Up: The assembly of the necessary structural and mechanical parts that provides the means to adjust the length of chain to compensate for stretch, shrink or wear in order to maintain proper tension.
Air Operated Take-up: A take-up mechanism where adjustments are made automatically by an air cylinder.

Counterweighted Take-up: A take-up mechanism where the adjustment is made automatically by the potential energy of weights.

Screw Take-up: A take-up mechanism having provision for manual adjustment by one or more screws.

Spring Take-up: A take-up mechanism where adjustments are made automatically by the potential energy of springs.

Track: The I-beam section on which trolley wheels roll while being propelled.

Traction Wheel Turn: A smooth wheel with out dogs or teeth to guide the conveyor chain around a horizontal curve.

Trolley: An assembly of two half-trolleys (each with a wheel, bearing and bracket) and an attachment. It is used to support and move suspended loads and to carry the load connecting and conveying chain.

Trolley Attachments:

Bolt Attachment: A trolley attachment having a threaded rod projection for attaching a load bar or various objects. Sometimes called a "B" attachment.

Clevis Attachment: A forked or clevis type trolley attachment. Sometimes called an "H" attachment.

Idler Attachment: An attachment used to complete the assembly of a nonleaded carrying trolley. Sometimes called an "I" attachment.

Pendant Attachment: A single bar trolley attachment projecting through the chain having a single hole for supporting loads. Sometimes called a "C" attachment.

Trolley Brackets: Drop forged, cast or pressed steel members to which the trolley wheels are attached with provisions for connecting to the chain.

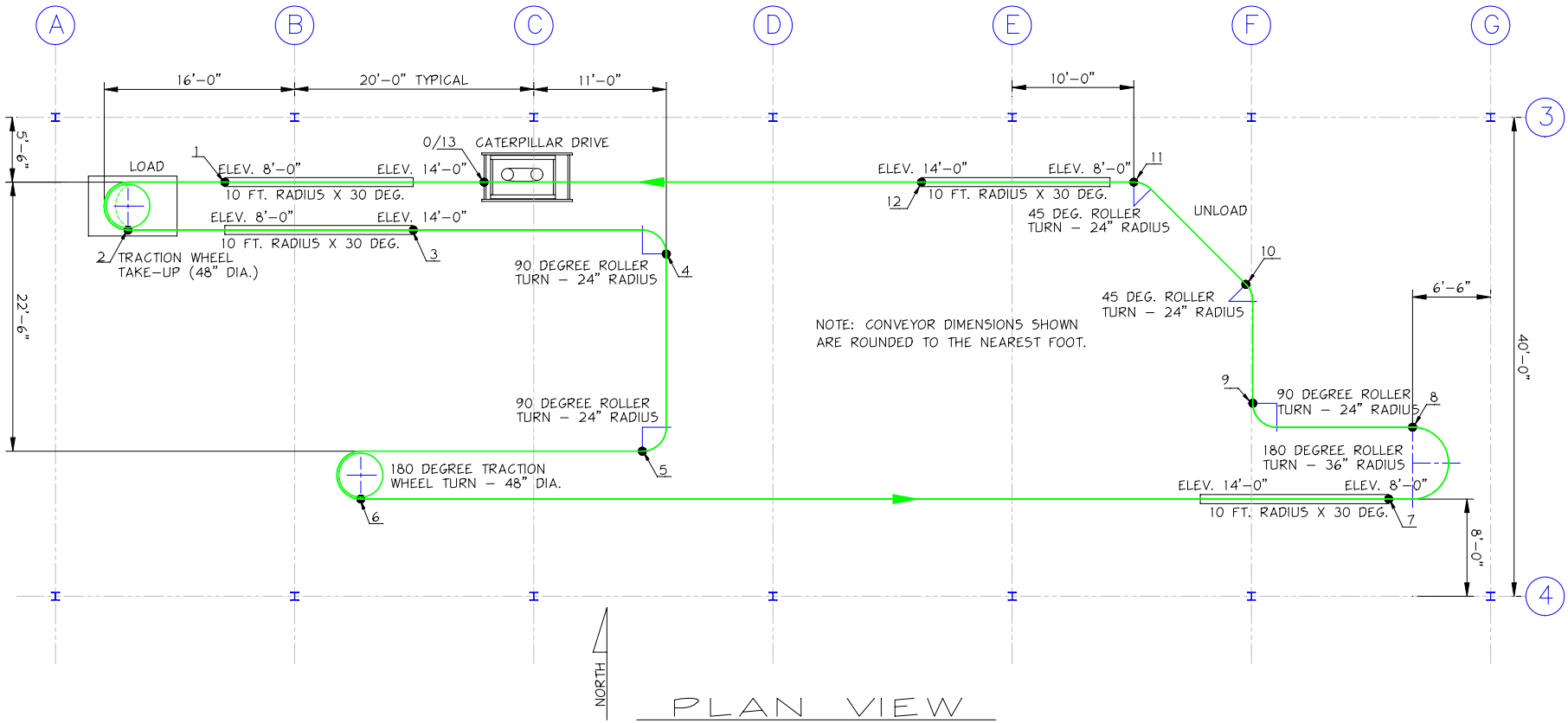
Trolley Wheel: The circular member with an integral bearing mounted to the trolley bracket.

Vertical Curve:

Compound Vertical Curve: An assembly of two single vertical curves with necessary connecting track to accomplish a change in elevation.

Single Vertical Curve: A section of track bent in a desired curve to change the direction of a conveyor in the vertical plane.

Typical Overhead Conveyor Layout



PLAN VIEW

Planning Your Overhead Conveyor System

An Overhead Conveyor System offers many advantages in terms of the ability to transport your product in unused plant spaces above the work area. The following design steps are recommended for your use and assistance in designing an Overhead Conveyor System. These steps are established procedures and practices that have been standardized in the material handling industry. Handling Systems engineers are always available for assistance in designing your system whether it is basic or complex involving custom engineered components for unusual applications.

Layout and Conveyor Path – Step 1

- Draw a layout of the building in which the conveyor is to be located either on graph paper or CAD system to a known scale (e.g. ¼"=1'-0" or ½"=1'-0").
- Identify columns or bays and dimension column centers. Identify the North direction.
- Locate, dimension and label all obstructions, which will affect the routing of the conveyor (e.g. columns, walls, machinery, ductwork, piping).
- Draw conveyor route so that it connects all areas in their proper sequence with the most economical path for the system. Keep parallel conveyor routes as closely spaced as possible to reduce the amount of supporting members and guards required. Avoid using horizontal curved sections of track in an incline or decline.
- Verify that the path of the conveyor does not interfere with any machine operations or work areas.
- Indicate the location of drives, vertical curves, horizontal turns, load & unload areas relative to the column grid. Refer to the typical layout and conveyor symbols in this manual.

Carriers – Step 2

- Determine the number of parts to be carried on one carrier. Establish the over all carrier size while maintaining the over all dimensions as compact as possible. Calculate the maximum weight of the carrier and product to determine the allowable trolley load.
- The design of the carrier should permit easy loading and unloading.
- Design carrier assembly to fit the trolley and chain attachments. Incorporating the design to fit standard trolley attachments will eliminate the cost of special attachments.
- Make a plan view layout of the carrier at the horizontal turns and an elevation view of a typical vertical curve to determine proper carrier spacing. Carrier and trolley spacing is relative to the size system you are planning to use. Trolley spacing must be in multiples of 6" for a 3" system, 8" for a 4" system and 12" for a 6" system.

Elevation – Step 3

- Elevations are measured from the floor level to the top of the conveyor track.
- The elevation of the conveyor track at the "Load" and "Unload" areas with carriers assembled on the trolleys is determined by the parts being handled and the convenience level for the operator to remove or place product on the carrier.
- Clearance over work areas and aisles should be at least 8'-0".
- Conveyor guarding is required wherever the bottom of the carrier is greater than 7'-0" above the finished floor.

Determining the Conveyor Size – Step 4

- Select trolley size by checking the maximum allowable load with the carrier weight.

Table No. 1
Approximate Allowable Suspended
Load on Two-Wheel Trolley

I-Beam Track Size	Maximum Load
3" I @ 5.7#	200 lbs.
4" I @ 7.7#	400 lbs.
6" I @ 12.5#	1200 lbs.

- Normally the trolley capacity will determine the size of the conveyor. In some cases, the maximum allowable chain pull may be exceeded even though the trolley loads may be within the capacity of the rail and trolleys. In these cases, either specify the next larger system or go to multiple drives. See the chain pull step for more information.

Determining System Production Rate – Step 5

- Reference step 2 for the number of parts per carrier.
- Determine the required production rate per hour.

Sample:	Carrier Capacity:	2 parts
	Production Requirements:	180 pts/hr.
	Req'd. No. of Carriers/hr.:	180 / 2 = 90
	Req'd. No. of Carriers/min.:	90 / 60 = 1.5

Determine Trolley Spacing – Step 6

- Refer to step 2 for carrier size.
- Refer to Table No. 2 & No. 3 for recommended maximum trolley spacing.
- If carrier size is larger than the recommended trolley spacing, intermediate trolleys are required for chain support.
- Reference the steps pertaining to the vertical curves and horizontal curves.

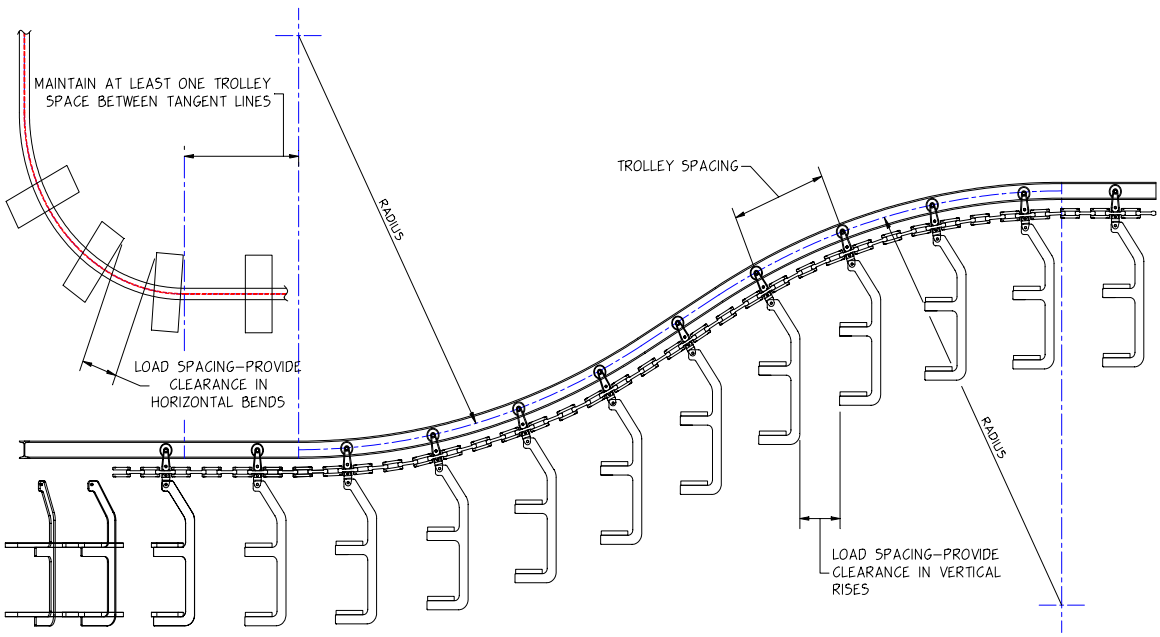
Selecting a Vertical Curve – Step 7

• Always use the largest possible radius for vertical curves to assure longer conveyor life. Use the minimum radius curves where absolutely necessary. Reference Table 2.

Table No. 2
Minimum Radii for Vertical Curve
With Drop Forged Rivetless Chain
(Radius Given to Centerline of I-Beam Track)

Chain Size	X-348		X-458		X-678	
Trolley Spacing	Min.	Max.	Min.	Max.	Min.	Max.
8"			5'-0"	6'-6"		
12"	5'-0"	6'-6"			8'-0"	12'-0"
16"			6'-6"	8'-0"		
18"	6'-6"	8'-0"				
24"	8'-0"	10'-0"	8'-0"	10'-0"	12'-0"	15'-0"
30"	10'-0"	12'-0"				
32"			10'-0"	12'-0"		
36"					15'-0"	20'-0"

• Create an elevation layout drawing showing two of the product carriers traveling up/down the vertical. Verify that the carriers clear each other and also clear the chain. Determine a tentative carrier spacing. (Reference sample drawing)
• Indicate on your scaled drawing the horizontal length between tangent points of each vertical curve along with its radius and degree.
• Locate each vertical in relation to the building grid or column location.



Selection of Horizontal Turns – Step 8

• Make a large-scale layout of a horizontal turn. Make two templates of the plan view of the carrier and move them properly spaced over the path of the horizontal turn. Check that the carriers clear each other. (Reference sample drawing)
• Select the horizontal turns best suited for the requirements from the roller turn and traction wheel section an as determined by the carrier clearance. A length of straight rail equal to one trolley space should always be provided between the tangent point of a horizontal turn and the tangent point of a vertical curve.

Table No. 3
Minimum Recommended Radius
And Diameter Turns
For Various Trolley Spacing

Chain Size	Trolley Spacing	Roller Turn Radius	Traction Wheel Diameter
X-348	Up to 18"	18"	24"
	24"		30"
	30"		36"
X-458	Up to 24"	24"	30"
	32"		36"
X-678	12"	36"	36"
	24"		42"
	36"		48"

• If an automatic take up is preferred or required it should be located as near as possible to the output side of the drive unit. A manual or screw operated take up can be located any other place in the conveyor layout, not necessarily directly after a drive unit.
• Use the same plan view layout of carriers to determine width of conveyor guards on horizontal turns. Allow for a minimum of 6” clearance on each side of carrier unless carriers or load are exceedingly long and would sway excessively.

Conveyor Speed - 9

• The speed of the conveyor should be determined by the production requirements, trolley spacing and the number of parts per carrier. The conveyor should not be operated faster than necessary as the wear of the chain, trolleys and turns can be directly proportioned to the speed.
• The required conveyor speed in F.P.M. is determined by multiplying the number of required carriers per minute by the carrier spacing in feet.

Sample: Number of Carriers per minute: 1.5
Carrier Spacing: 48” or 4’-0”
Conveyor Speed: 1.5 x 4 = 6 F.P.M.

• If variations in production are required, it is advisable to set the maximum conveyor speed to at least two times the calculated conveyor speed. On a single drive system; the most economical way to adjust chain speeds is to use a 3:1 mechanical variable speed pulley and an adjustable motor base.

Determining the Overall Conveyor Length – Step 10

✓ From your conveyor layout, add all of the straight track dimensions.
✓ Add all of the arc lengths from the horizontal turns.
✓ Add all of the arc lengths from the vertical curves.
✓ The total length would be the sum of the above dimensions. Add at least 3% or a minimum of 10'-0" to the total length of the conveyor.

Determining the Moving Load – Step 11

✓ The moving load on a conveyor system is the total sum of weights of all the moving parts, chain, trolleys, carriers and loads.
✓ From step 10 you will have the conveyor length, determine the number of loaded carriers on the system and the number of unloaded carriers on the system.

Sample: Total Conveyor Length:	320'-0"
Trolley Spacing:	2'-0"
Carrier Spacing:	4'-0"
Total No. of Trolleys:	160
Total No. of Carriers:	80
Loaded Carriers:	70 @ 150 lbs.
Empty Carriers:	10 @ 30 lbs.

Solving for the Total Moving Load:

320'-0" X-348 Chain @ 1.50lbs./ft.:	480 lbs.
160 Trolleys @ 7.5lbs.:	1,200 lbs.
70 Loaded Carriers @ 150 lbs.:	10,500 lbs.
10 Empty Carriers @ 30 lbs.:	300 lbs.
Total Moving Load:	12,480 lbs.

Determining the Lift Load – Step 12

✓ A lift load is the amount of force required to pull the moving load upward along the vertical curves from a low point to a high point in the system.
✓ To calculate a lift load, determine the difference in elevation of a loaded vertical curve traveling upward in the system. The lift load or chain pull for an elevation change of the conveyor is equal to the lift height in feet multiplied by the individual live load weight in pounds and then divided by the load spacing in feet.

Sample:	Net Vertical Rise:	6'-0"
	Carrier Load:	150 lbs.
	Carrier Spacing:	4'-0"
	Lift Load:	$\frac{\text{6'-0" x 150 lbs.}}{\text{4'-0"}}$ = 225 lbs.

✓ In most cases the lift loads due to loaded inclines will be balanced by loaded declines, however, unless other information exists at least one lift load (loaded incline) should be added to the friction chain pull to obtain a total chain pull. It is advantageous to include all lift load (loaded incline) because the situation could very well occur.

✓ The chain, trolleys and individual carriers are not included in the lift load calculation because they are balanced by the portion of the system that moves down the vertical curves.

Chain Pull Calculation – Short Method – Step 13

✓ Chain pull is developed from the friction losses on the trolleys caused by the travel of the Total Moving Load, Vertical curves and friction losses at the horizontal turns. The friction figure is represented as a small percentage and is listed under Friction Factors for individual size conveyors and operating conditions.
✓ Friction Factors listed are for average conveyors that operate under normal conditions. A large number of vertical and horizontal curves will increase the friction factor.

Table 4
Approximate Friction Factors
For Various Trolleys

Chain Size	Trolley and Track Size	Friction Factor
X-348	3"	3%
X-458	4"	2 ½%
X-678	6"	2%

✓ To determine the chain pull due to friction, multiply the Total Moving Load by the selected friction factor from Table 4.

Sample: Total Moving Load: 12480 lbs.(Step 11)
Friction Factor: .03 (3%)
Friction Chain Pull: 12,480lbs. x .03 = 374 lbs.

✓ To determine the Total Chain Pull, add the Lift Load to the Friction Chain Pull.

Sample: Friction Chain Pull: 374 lbs.
Lift Load: +225 lbs. (*2)
Total Chain Pull: 824 lbs.

Select 1200 lbs. Caterpillar Drive or Sprocket Drive

✓ Refer to Chain section to verify chain size selected has ample capacity for the Total Chain Pull.

Chain Pull Calculations – Progressive Method – Step 13 Option

- ✓ For long lines of complicated conveyor paths with a large number of vertical curves or where more than one drive unit is required, it is necessary to make a Progressive chain pull analysis. On multi-drive conveyor systems, it is usually required to assume the approximate drive locations. It may also be necessary to run a chain pull analysis two or three times to determine the best drive locations. The best location for drives will be at the highest point in the system and the take-ups at the lowest point in the system.
- ✓ In a progressive chain pull analysis, friction factors or losses are progressively estimated and accumulated through the path of the conveyor, starting at the slack side of the drive where the chain pull is minimum.
- ✓ Review the Tables in this section for estimated friction factors.

The following sample problem and calculation is based upon the typical overhead conveyor layout drawing in this section. Refer to friction factor Tables in this section.

Assume the following conditions are known:

Moving Load Weight Per Foot – Loaded Carrier

Chain Wt.		=	2.50 lbs./ft.
Trolley	3.5 lbs. each / 2	=	1.75 lbs./ft.
Carrier	30 lbs. each / 4	=	7.50 lbs./ft.
Product	120 lbs. each / 4	=	30 lbs./ft.
Total Moving Load		=	41.75 lbs./ft.

Moving Load Weight Per Foot – Unloaded Carrier

Chain Wt.		=	2.50 lbs./ft.
Trolley	3.5 lbs. each / 2	=	1.75 lbs./ft.
Carrier	30 lbs. each / 4	=	7.50 lbs./ft.
Total Moving Load		=	11.75 lbs./ft.

Track Size:	3” I-Beam	Product Load:	30.00 lbs./ft.
Chain:	X-348	Empty Carriers:	11.75 lbs./ft.
Trolley Spacing:	2’-0”	Loaded Carriers:	41.75 lbs./ft.
Carrier Spacing:	4’-0”	Conveyor Length:	320 ft.

Sample Problem for Accumulated Chain Pull Analysis

Work Points	Track Length Between Work Pts.	Description / Calculation	Chain Pull At Individual Operations	Chain Pull End of Individual Work Points	Total Accumulated Chain Pull
0	0'	Caterpillar Drive	0	0	0
0 to 1	22'	3% x 22'-0" x 11.75 lbs. (Unloaded)	7.76		
		Vertical 30 Deg.= 3% x 7.76	0.23		
		Declining Load = 6 ft. x 11.75lbs.*	(-70.55)	(-62.56)	0
1 to 2	14'	3% x 14'-0" x 11.75lbs. (Unloaded)	4.93		
		Traction Wheel 180 Deg. 3% x 37.24	1.11	6.04	6.04
2 to 3	24'	3% x 24'-0" x 44.75 lbs.	32.22		
		Vert. 30 Deg. = 3% x 38.26	1.14		
		Incline Load = 6'-0" x 44.75 lbs.	268.5	301.86	307.9
3 to 4	22'	3% x 22'-0" x 44.75 lbs.	29.53		
		Roller Turn 90 Deg. = 3% x 337.44	10.12	39.65	347.6
4 to 5	18'	3% x 18'-0" x 44.75 lbs.	24.17		
		Roller Turn 90 Deg. = 3% x 371.77	11.15	35.32	382.9
5 to 6	30'	3% x 30'-0" x 44.75 lbs.	40.28		
		Traction Wheel 180 Deg. 3% x 423.18	12.7	52.98	435.9
6 to 7	86'	3% x 86'-0" x 44.75 lbs.	115.46		
		Vert. 30 Deg. = 3% x 551.36	16.54		
		Decline Load = 6 ft. x 11.75 lbs.*	(-70.55)	61.45	497.4
7 to 8	11'	3% x 11'-0" x 44.75 lbs.	14.77		
		Roller Turn 180 Deg. = 5% x 512.12	25.61	40.38	537.7
8 to 9	15'	3% x 15'-0" x 44.75 lbs.	20.14		
		Roller Turn 90 Deg. = 3% x 557.84	16.74	36.88	574.6
9 to 10	10'	3% x 10'-0" x 44.75 lbs.	13.43		
		Roller Turn 45 Deg. = 2% x 588.03	11.76	25.19	599.8
10 to 11	13'	3% x 13'-0" x 44.75 lbs.	17.45		
		Roller Turn 45 Deg. = 2% x 617.25	12.35	29.8	629.6
11 to 12	18'	3% x 18'-0" x 11.75 lbs. (Unloaded)	6.35		
		Vert. 30 Deg. = 3% x 635.95	19.08		
		Incline Load = 6'-0" x 11.75 lbs.	70.5	95.93	725.5
12 to 13	37'	3% x 37'-0" x 11.75 lbs. (Unloaded)	13.04		
		Friction Thru Drive = 5% x 738.54	36.93	49.97	775.5

Length 320 ft. Total Accumulated Chain Pull = 775.5 lbs.

Based on these calculations a 1200 lbs. capacity drive would be the correct selection.
*Declining product loads are not deleted from the Accumulated Chain Pull total because conveyor may not be fully loaded at the declines.

Maximum Chain Pulls with Vertical Curves

Maximum Live Load Plus Wt. of Carrier	3" Conveyor System Maximum Chain Pull - Pounds (With Vertical Curves)											
	Horizontal Chain Pull	6'-6" Rad. Bend			8'-0" Radius Bend				10'-0" Radius Bend			
		Trolley Spacing			Trolley Spacing				Trolley Spacing			
		12"	18"	24"	12"	18"	24"	30"	12"	18"	24"	30"
20	2500	1630	1080	820	2210	1470	1120	890	2210	1840	1400	1120
30	"	1580	1050	790	2190	1420	1080	860	2210	1770	1350	1080
40	"	1510	1010	760	2100	1370	1050	830	2210	1700	1290	1050
50	"	1460	980	720	2020	1310	1010	790	2210	1640	1250	1010
75	"	310	870	650	1810	1190	900	710	2210	1470	1120	900
100	"	1170	780	580	1620	1050	810	630	1910	1310	1000	810
125	"	1020	680	510	1420	910	700	560	1670	1150	870	710
150	"	870	580	430	1210	790	600	470	1430	990	740	600
175	"	720	480	370	1010	650	510	400	1190	820	620	500
200	"	580	390	290	810	530	400	310	960	650	490	400
225	"	410	290	220	600	390	290	240	710	450	370	290
250	"	290	190	-	400	260	200	-	470	320	250	200

Maximum Live Load Plus Wt. of Carrier	4" Conveyor System Maximum Chain Pull - Pounds (With Vertical Curves)											
	Horizontal Chain Pull	6'-6" Rad. Bend		8'-0" Rad. Bend			10'-0" Rad. Bend			12'-0" Rad. Bend		
		Trolley Spacing		Trolley Spacing			Trolley Spacing			Trolley Spacing		
		16"	24"	16"	24"	32"	16"	24"	32"	16"	24"	32"
20	4000	2530	1690	3390	2250	1690	4000	2910	2170	4000	3390	2650
30	"	2490	1660	3320	2210	1660	"	2850	2140	"	3320	2600
40	"	2440	1630	3260	2170	1630	"	2800	2110	"	3260	2560
50	"	2400	1600	3210	2140	1600	"	2760	2060	"	3210	2510
75	"	2290	1530	3070	2040	1530	3930	2630	1970	"	3070	2400
100	"	2190	1460	2920	1950	1460	3720	2500	1870	"	2920	2280
125	"	2070	1390	2780	1850	1390	3570	2380	1780	"	2780	2170
150	"	1970	1310	2630	1750	1310	3380	2220	1680	3940	2630	2050
200	"	1740	1170	2340	1560	1170	3010	2000	1490	3480	2330	1830
250	"	1520	1020	2040	1360	1020	2630	1740	1310	3060	2040	1600
300	"	1310	870	1740	1170	870	2250	1490	1120	2630	1740	1370
350	"	1090	720	1460	970	720	1870	1250	930	2190	1460	1140
400	"	870	580	1170	780	580	1500	1000	750	1740	1170	910
450	"	650	430	870	580	430	1120	750	560	1310	870	680
500	"	430	-	580	-	-	740	490	-	870	580	450

Reference Tables for Overhead Conveyor Friction Factors

Standard Trolley Assemblies

Temperature Variation	Wheel Size		
	3"	4"	6"
35 to 250 Deg. F. (Average Condition)	2.00%	1.75%	1.50%
250 to 375 Deg. F. (High Temp. Grease)	3.00%	2.50%	2.00%
375 to 480 Deg. F. (Open Trolleys Rec'd.)	6.00%	3.75%	2.50%

Traction Wheel (Approx.)

Dia.	Degrees	Roller Brg. To 250 F.	Carbon Brg. To 350 F.	Carbon Brg. To 550 F.
24"	30	1.58%	3.75%	5.25%
	45	1.80%	4.12%	6.00%
	90	2.25%	5.25%	7.50%
	180	3.15%	7.50%	10.50%
36"	30	1.05%	2.50%	3.50%
	45	1.20%	2.75%	4.00%
	90	1.50%	3.50%	5.00%
	180	2.10%	5.00%	7.00%
48"	30	0.55%	2.00%	2.66%
	45	0.70%	2.25%	3.00%
	90	1.00%	2.75%	3.75%
	180	1.50%	3.75%	5.25%
60"	30	0.44%	1.60%	2.13%
	45	0.56%	1.80%	2.40%
	90	0.80%	2.20%	3.00%
	180	1.28%	3.00%	4.20%
72"	30	0.42%	1.52%	2.02%
	45	0.53%	1.70%	2.28%
	90	0.76%	2.10%	2.85%
	180	1.22%	2.85%	4.00%

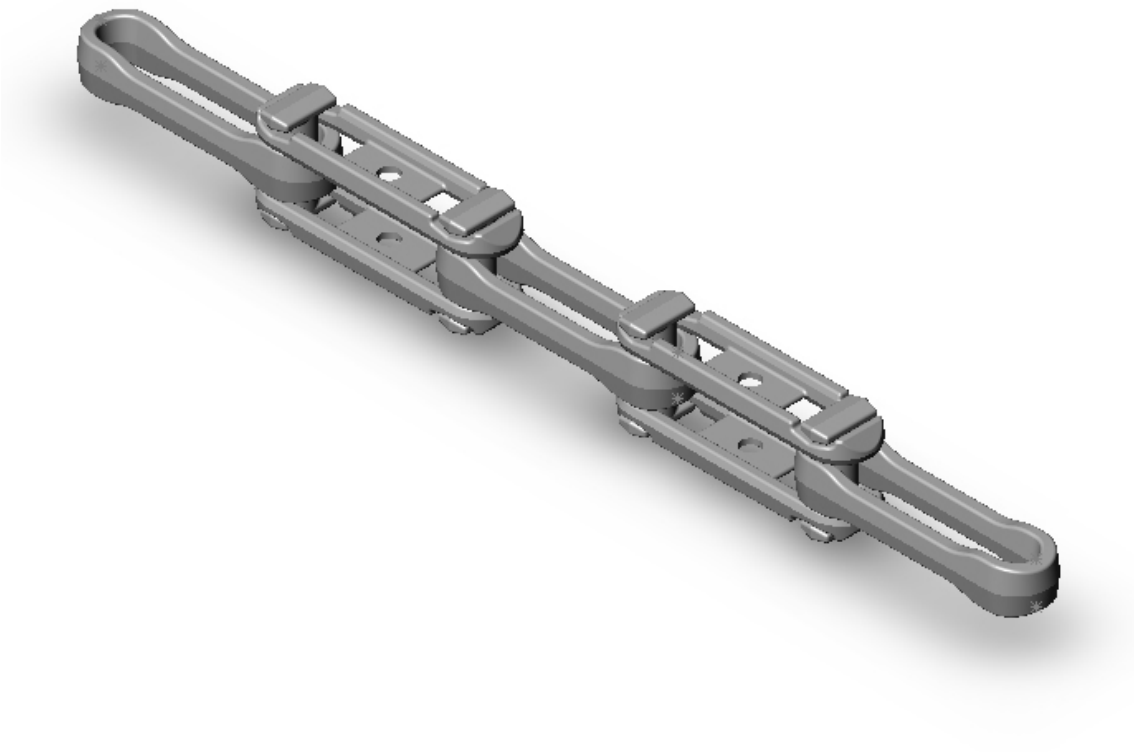
Roller Turn (Approx.)

Dia.	Degrees	Roller Brg. To 250 F.	Carbon Brg. To 350 F.	Carbon Brg. To 550 F.
24"	30	2.42%	2.66%	3.40%
	45	3.00%	3.30%	4.30%
	90	4.80%	5.28%	6.80%
	180	8.52%	9.35%	12.10%
36"	30	2.20%	2.42%	3.10%
	45	2.75%	3.00%	3.90%
	90	4.40%	4.80%	6.20%
	180	7.75%	8.50%	11.00%
48"	30	2.00%	2.20%	2.80%
	45	2.50%	2.75%	3.50%
	90	4.00%	4.40%	5.60%
	180	7.00%	7.70%	9.80%
60"	30	2.00%	2.20%	2.80%
	45	2.50%	2.75%	3.50%
	90	4.00%	4.40%	5.60%
	180	7.00%	7.70%	9.80%
72"	30	1.90%	2.10%	2.70%
	45	2.40%	2.60%	3.40%
	90	3.80%	4.20%	5.40%
	180	6.70%	7.40%	9.40%

Compound Vertical Curves (Approx.)

Radius	15 Degree	20 Degree	30 Degree	45 Degree	60 Degree
6'-0"	2.80%	3.80%	5.60%	7.00%	9.80%
8'-0"	2.40%	3.20%	4.80%	6.00%	8.40%
10'-0"	2.00%	2.66%	4.00%	5.00%	7.00%
12'-0"	2.00%	2.66%	4.00%	5.00%	7.00%

Overhead Conveyor Chain



The “X” type chain is drop forged and heat treated for added strength and resistance to corrosion and abrasive action. This type of chain has the advantages of a high strength-to-weight ratio, excellent wear qualities and the ability to flex easily in both horizontal and vertical curves. The heat-treating also provides the ability to withstand high shock loads.

This chain can be easily assembled and disassembled without the need for tools but will not come apart. The chain is symmetrical and can be turn 180 degrees around and operated in the opposite direction.

All drop forged steel chains require a certain “wear-in” period after a new conveyor is installed. The elongation and extra length developed from the “wear-in” is absorbed with an automatic take-up assembly.

Overhead Conveyor Chain

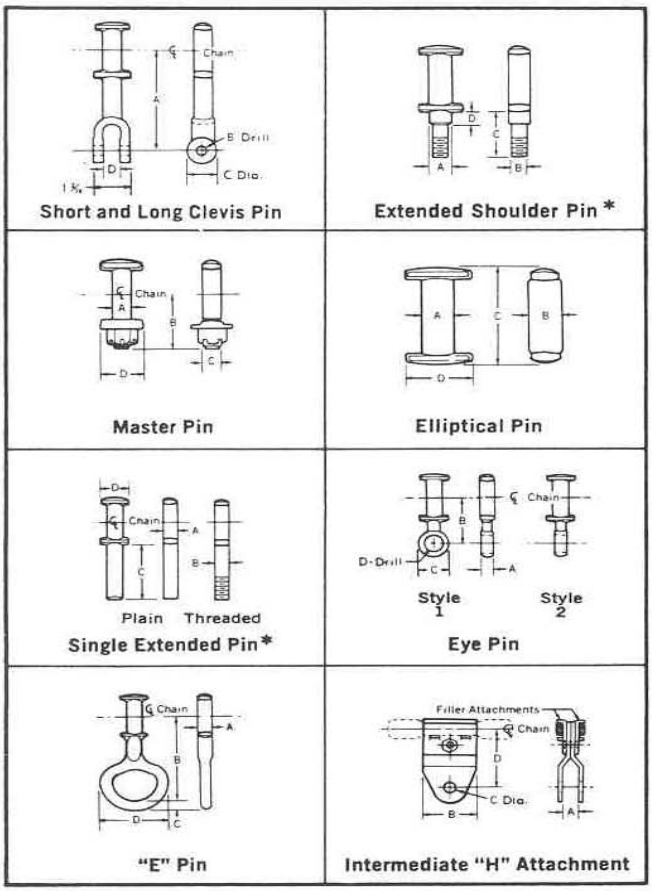
The size and type of chain is probably the most important element in the overhead conveyor system. A major factor in choosing the size of chain is the total chain pull in the system, and the number of drives, which enables you to determine the maximum chain pull in any one area. The following chart supplies the information necessary to determine the correct chain.

Selection Factors for Overhead Trolley Conveyor
Standard Drop Forged Heat Treated Rivetless Chain

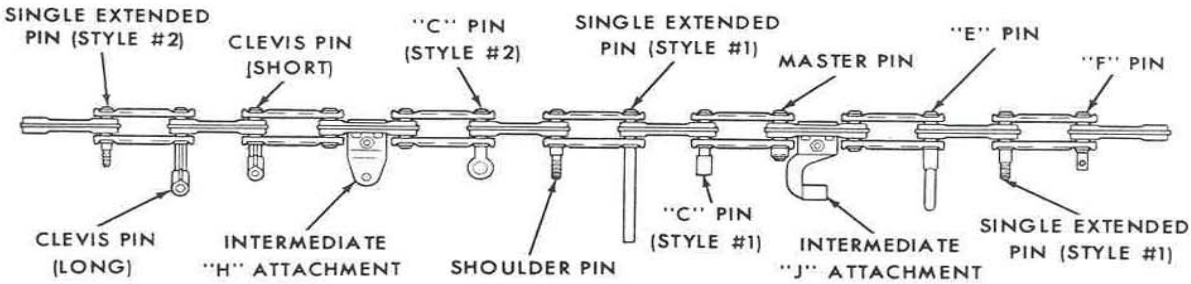
Type of Chain*	X-348	X-458	X-678
Nominal Pitch	3"	4"	6"
Pin Diameter	4/8"	5/8"	7/8"
Wt. Per Foot	2.1 lbs.	3.1 lbs.	6.5 lbs.
Ultimate Strength	24,000 lbs.	48,000 lbs.	85,000 lbs.
Working Load Straight Line Pull			
-Maximum	3,200 lbs.	7,000 lbs.	12,000 lbs.
-Recommended	2,200 lbs.	4,000 lbs.	6,500 lbs.
Maximum Recommended Chain Tension			
Condition A - Ideal	2,000 lbs.	3,200 lbs.	6,000 lbs.
Condition B - Average	1,400 lbs.	2,200 lbs.	4,000 lbs.
Condition C - Severe	Consult HSC Engineering		
Recommended Chain Pull per Drive**			
Condition A - Ideal	1,500 ft.	2,000 ft.	2,500 ft.
Condition B - Average	1,500 ft.	2,000 ft.	2,500 ft.
Condition C - Severe	Consult HSC Engineering		

*X Chains are used interchangeably with standard rivetless chains.
**If factors like slow speed (around 10 fpm), small radius horizontal or vertical curves and high chain tension are present, a chain surge could occur.

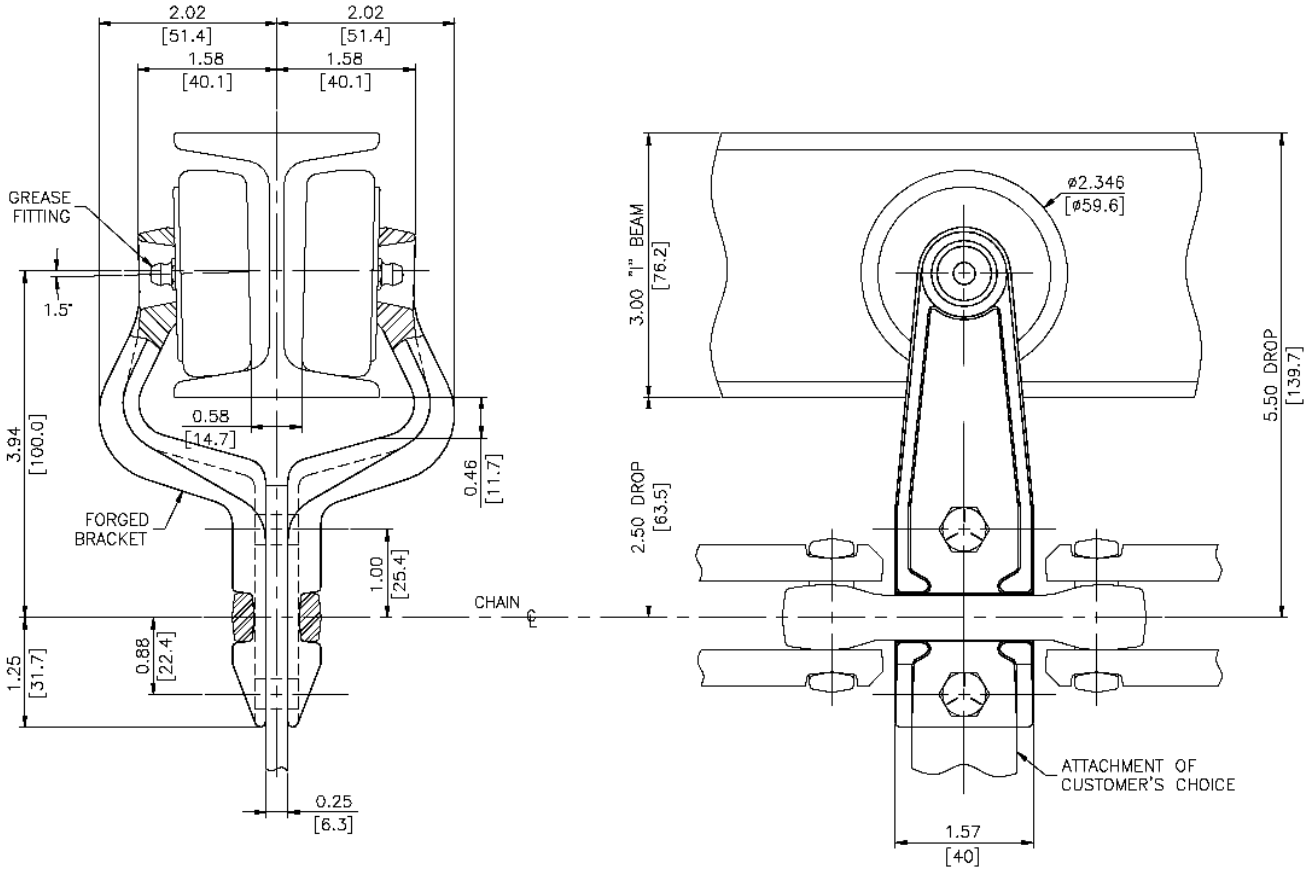
Chain Attachments



Part	Chain	A	B	C	D
Short Clevis	348	2 1/2	25/64	15/16	9/16
	458	3	25/64	15/16	9/16
Long Clevis	348	3 1/8	25/64	15/16	9/16
	458	4	25/64	1	9/16
Master Pin	348	1/2	1 7/16	3/8	1
	458	5/8	2 1/8	1/2	1 7/32
	468	3/4	2 5/16	5/8	1 11/16
	678	7/8	2 3/8	5/8	1 7/8
Elliptical Pin	348	31/64	33/64	1 3/4	1
	458	5/8	21/32	2 13/64	1 7/32
	678	7/8	15/16	3 3/32	1 7/8
Single Extended Pin	348	1/2	1/2	2	1
	348	1/2	1/2	2 1/8	1
	348	1/2	1/2	4 1/8	1
	458	5/8	1/2	1 1/8	1 7/32
	458	5/8	1/2	1 1/4	1 7/32
	458	5/8	1/2	1 1/4	1 7/32
	458	5/8	1/2	1 5/16	1 7/32
	458	5/8	1/2	1 1/2	1 7/32
	458	5/8	1/2	2 1/2	1 7/32
	458	5/8	1/2	2 5/8	1 7/32
	458	5/8	1/2	4 7/8	1 7/32
	458	5/8	5/8	2	1 7/32
	458	5/8	5/8	3 1/2	1 7/32
	458	5/8	5/8	5 1/2	1 7/32
	678	7/8	5/8	3	1 7/8
	678	7/8	3/4	1 1/2	1 7/8
	678	7/8	7/8	2 1/4	1 7/8
Eye Pin	458	1/2	2 1/8	1 1/4	25/32
Intermediate "H" Attachment	348	9/16	1 5/8	17/32	3 1/8
	458	11/16	2 1/4	17/32	2 7/8
Extended Shoulder Pin	458	5/8	1/2	1 1/2	3/8
	678	7/8	5/8	1 3/4	33/64
	678	7/8	5/8	2 1/8	33/64
"E" Pin	458	5/8	4 1/4	1/2	3



3” I-Beam Trolley X-348
Vertical Hole – 5 ½” Drop



Part Number	Wheel Design	Shielding	Bracket Type	Attach. Holes	Wheel to Brkt. Connect
5200234	Retainer	Open	Forged 5-1/2" Drop	Vertical	Swaged
5240034	Retainer	Splashproof	Forged 5-1/2" Drop	Vertical	Swaged
5280034	Retainer	Triple Labyrinth	Forged 5-1/2" Drop	Vertical	Swaged
5270034	Retainer	Contact Lip Seal-Nitrile	Forged 5-1/2" Drop	Vertical	Swaged
5210234	Retainer	Welsh Plug Only, No Shield	Forged 5-1/2" Drop	Vertical	Swaged
5220234	Retainer	Shield Only, No Welsh Plug	Forged 5-1/2" Drop	Vertical	Swaged
5400234	Full Ball Comp.	Open	Forged 5-1/2" Drop	Vertical	Swaged
5410234	Full Ball Comp.	Welsh Plug Only, No Shield	Forged 5-1/2" Drop	Vertical	Swaged
5420234	Full Ball Comp.	Shield Only, No Welsh Plug	Forged 5-1/2" Drop	Vertical	Swaged
5440034	Full Ball Comp.	Splashproof	Forged 5-1/2" Drop	Vertical	Swaged
5470034	Full Ball Comp.	Contact Lip Seal-Nitrile	Forged 5-1/2" Drop	Vertical	Swaged
5479034	Full Ball Comp.	Contact Lip Seal-Viton	Forged 5-1/2" Drop	Vertical	Swaged

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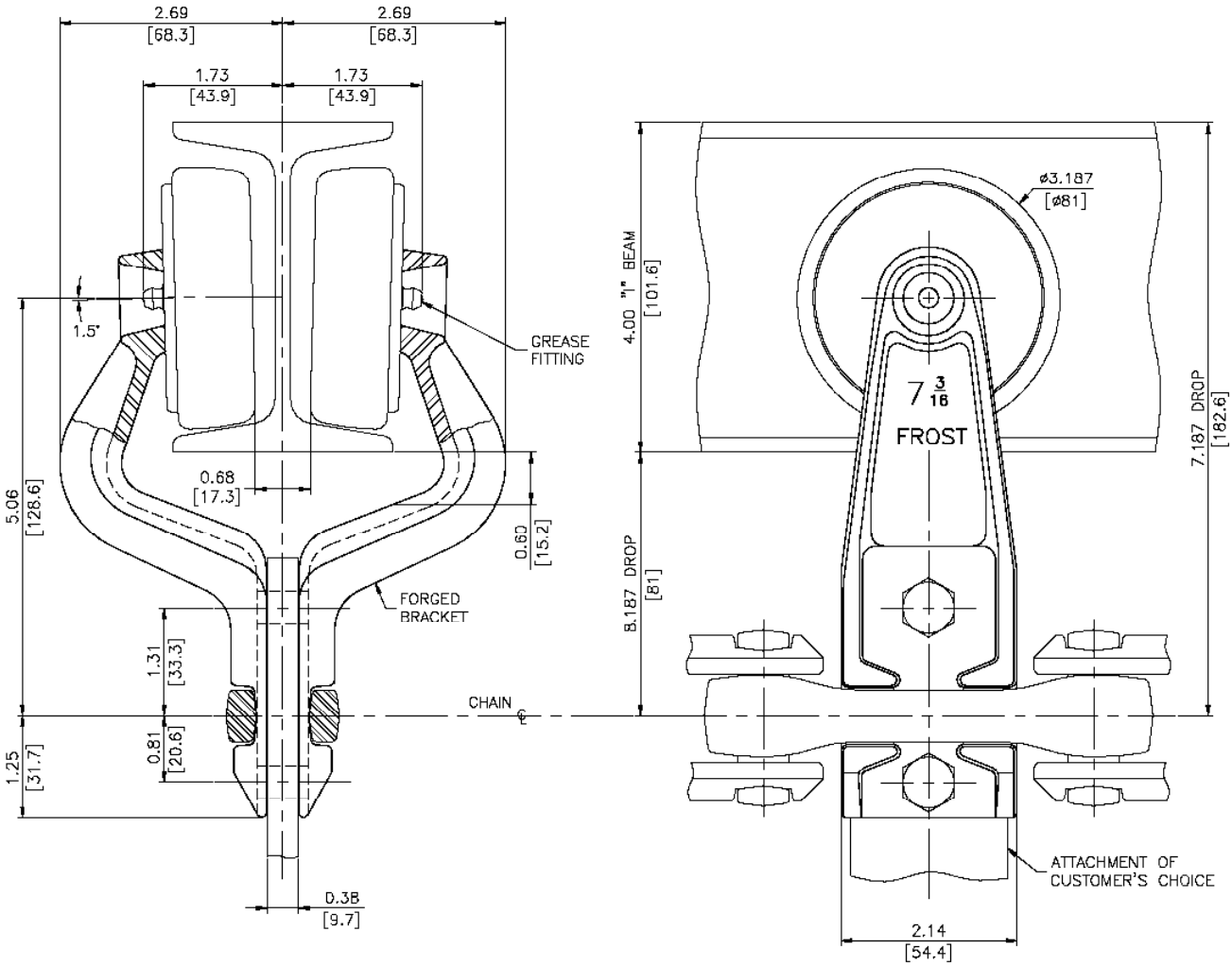
4” I-Beam Trolley X-458
Vertical Hole – 7 3/16” Drop



Part Number	Wheel Design	Shielding	Bracket Type	Attach. Holes	Wheel to Brkt. Connect
7200273	Retainer	Open	Forged 7-3/16" Drop	Vertical	Swaged
7240073	Retainer	Splashproof	Forged 7-3/16" Drop	Vertical	Swaged
7250073	Retainer	Splashproof & Wiper-Nitrile	Forged 7-3/16" Drop	Vertical	Swaged
7270073	Retainer	Contact Lip Seal-Nitrile	Forged 7-3/16" Drop	Vertical	Swaged
7500273	Full Ball Comp.	Open	Forged 7-3/16" Drop	Vertical	Swaged
7510273	Full Ball Comp.	Welsh Plug Only, No Shield	Forged 7-3/16" Drop	Vertical	Swaged
7520273	Full Ball Comp.	Shield Only, No Welsh Plug	Forged 7-3/16" Drop	Vertical	Swaged
7540073	Full Ball Comp.	Splashproof	Forged 7-3/16" Drop	Vertical	Swaged
7550073	Full Ball Comp.	Splashproof/Wiper-Nitrile	Forged 7-3/16" Drop	Vertical	Swaged
7559573	Full Ball Comp.	Splashproof/Wiper Seal Viton High Temp	Forged 7-3/16" Drop	Vertical	Swaged
7570073	Full Ball Comp.	Contact Lip Seal-Nitrile	Forged 7-16" Drop	Vertical	Swaged
7579073	Full Ball Comp.	Contact Lip Seal-Viton	Forged 7-16" Drop	Vertical	Swaged

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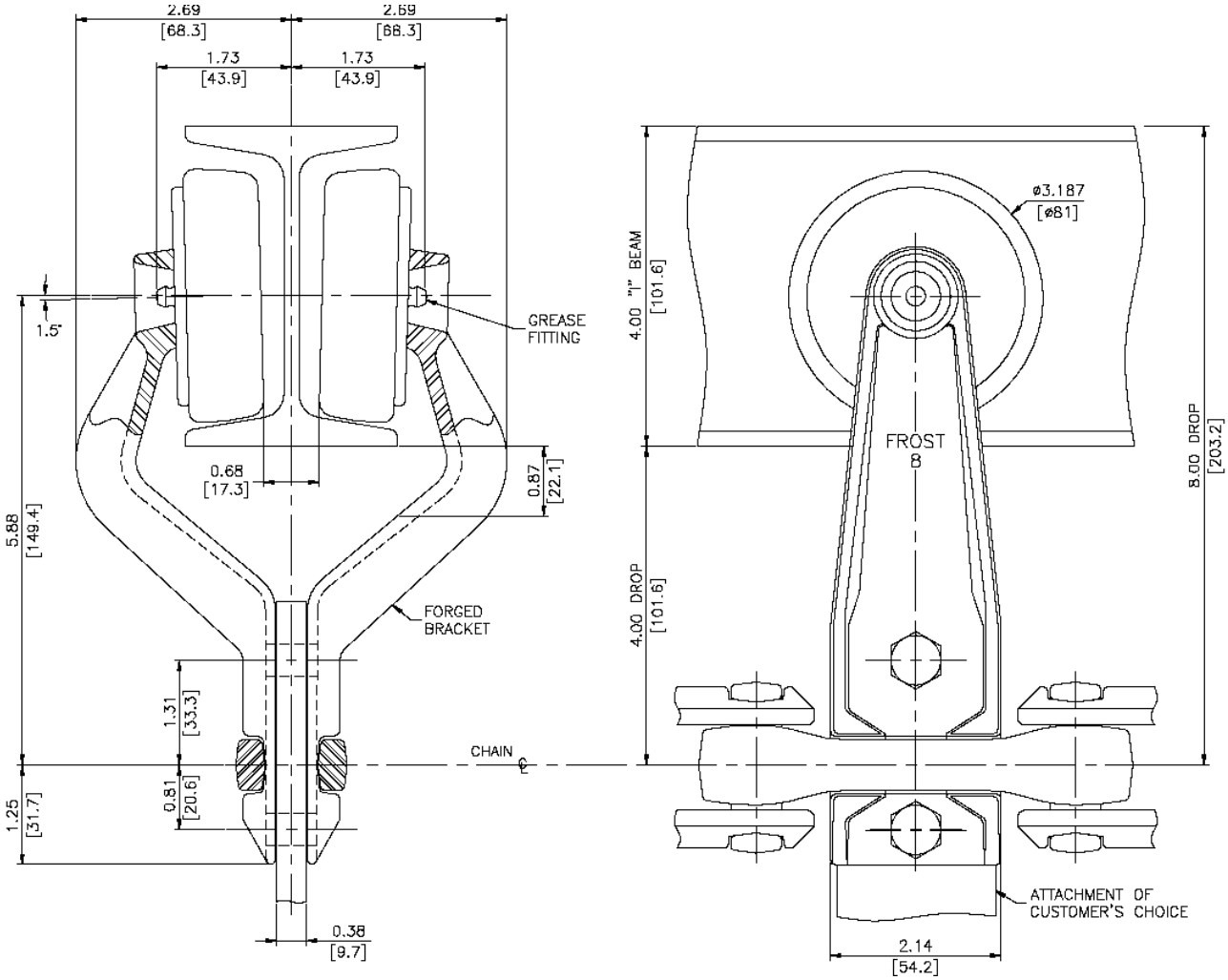
4” I-Beam Trolley - X-458
Vertical Hole – 8” Drop



Part Number	Wheel Design	Shielding	Bracket Type	Attach. Holes	Wheel to Brkt. Connect
7200279	Retainer	Open	Forged 8" Drop	Horizontal	Swaged
7240079	Retainer	Splashproof	Forged 8" Drop	Horizontal	Swaged
7250079	Retainer	Splashproof & Wiper-Nitrile	Forged 8" Drop	Horizontal	Swaged
7270079	Retainer	Contact Lip Seal-Nitrile	Forged 8" Drop	Horizontal	Swaged
7500279	Full Ball Comp.	Open	Forged 8" Drop	Horizontal	Swaged
7510279	Full Ball Comp.	Welsh Plug Only, No Shield	Forged 8" Drop	Horizontal	Swaged
7520279	Full Ball Comp.	Shield Only, No Welsh Plug	Forged 8" Drop	Horizontal	Swaged
7540079	Full Ball Comp.	Splashproof	Forged 8" Drop	Horizontal	Swaged
7550079	Full Ball Comp.	Splashproof/Wiper-Nitrile	Forged 8" Drop	Horizontal	Swaged
7559579	Full Ball Comp.	Splashproof/Wiper Seal Viton High Temp	Forged 8" Drop	Horizontal	Swaged
7570079	Full Ball Comp.	Contact Lip Seal-Nitrile	Forged 8" Drop	Horizontal	Swaged
7579079	Full Ball Comp.	Contact Lip Seal-Viton	Forged 8" Drop	Horizontal	Swaged

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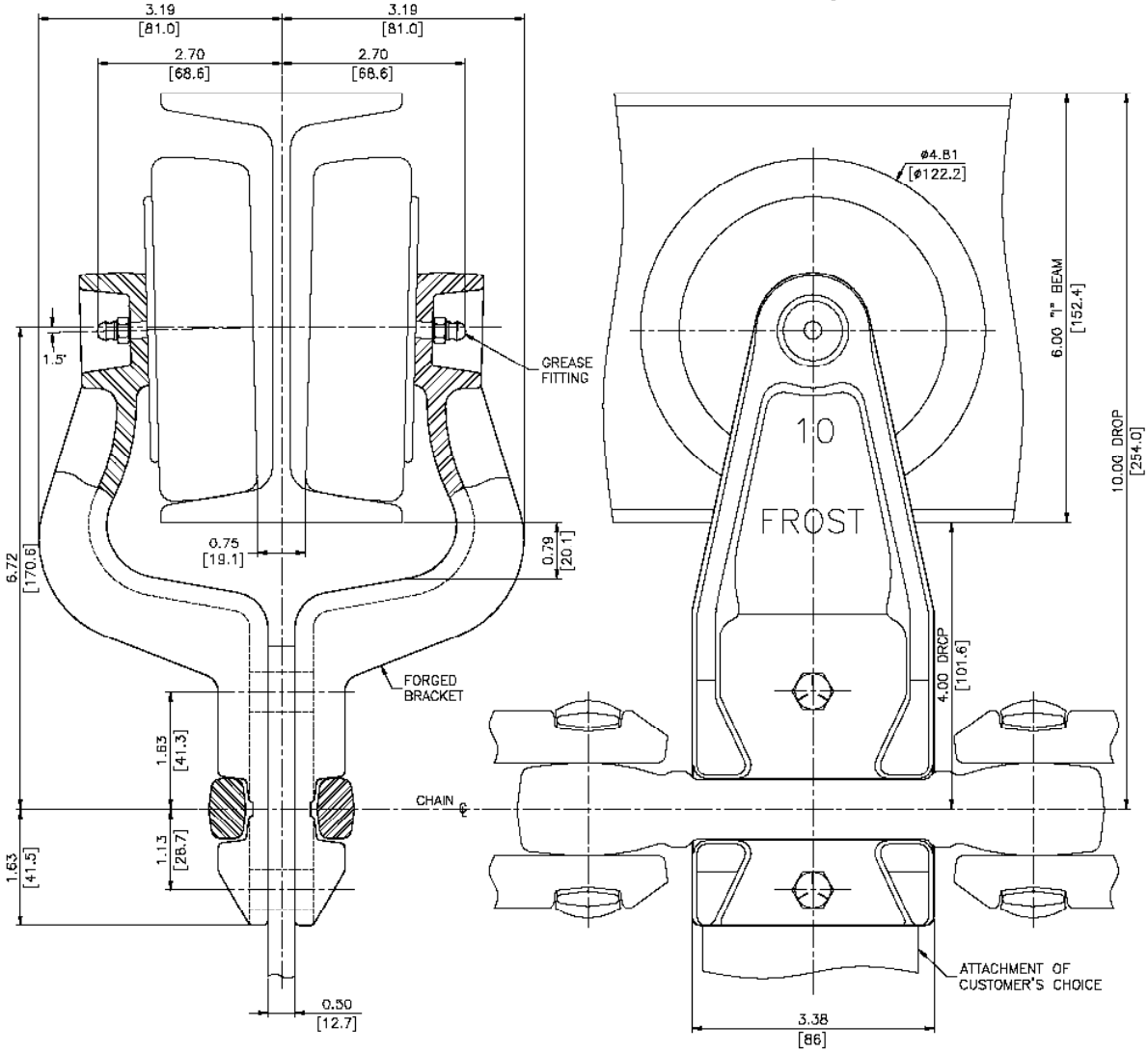
6” I-Beam Trolley - X-678
Vertical Hole – 10” Drop



Part Number	Wheel Design	Shielding	Bracket Type	Attach. Holes	Wheel to Brkt. Connect
9010060	Retainer	Splashproof	Forged 10" Drop	Vertical	Swaged
9260060	Retainer	Splashproof & Wiper -Nitrile	Forged 10" Drop	Vertical	Swaged
9261060	Retainer	Splachproof/Wiper Seal Viton High Temp	Forged 10" Drop	Vertical	Swaged
6460260	Full Ball Comp.	Open	Forged 10" Drop	Vertical	Swaged
9480060	Full Ball Comp.	Splashproof	Forged 10" Drop	Vertical	Swaged
6470260	Full Ball Comp.	Welsh Plug Only, No Shield	Forged 10" Drop	Vertical	Swaged
6474260	Full Ball Comp.	Shield Only, No Welsh Plug	Forged 10" Drop	Vertical	Swaged
9270060	Full Ball Comp.	Splashproof/Wiper-Nitrile	Forged 10" Drop	Vertical	Swaged
9271060	Full Ball Comp.	Splashproof/Wiper Seal Viton High Temp	Forged 10" Drop	Vertical	Swaged

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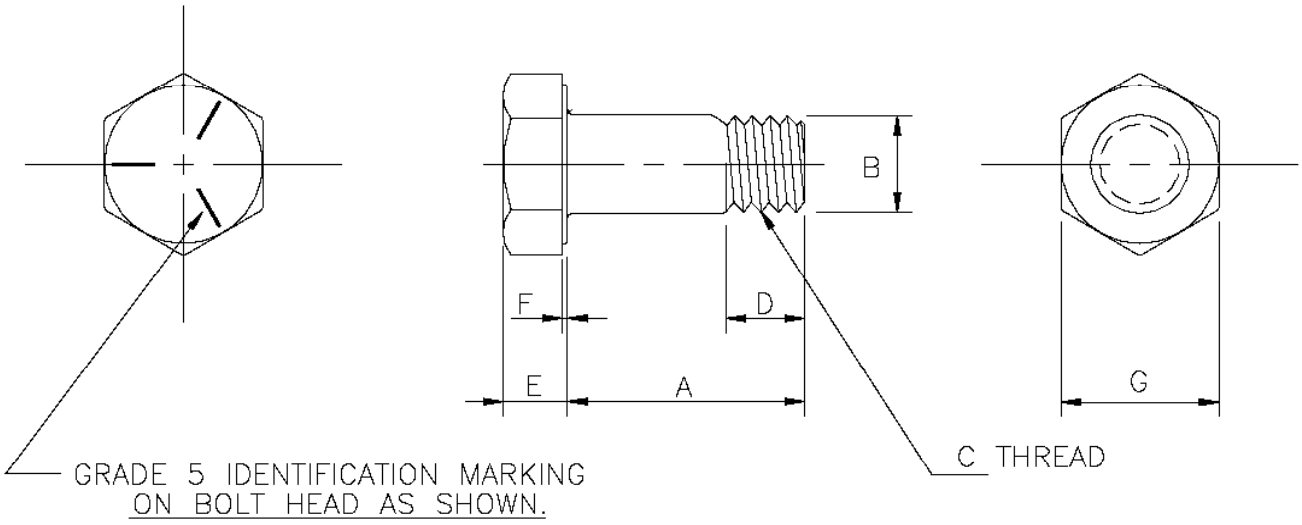
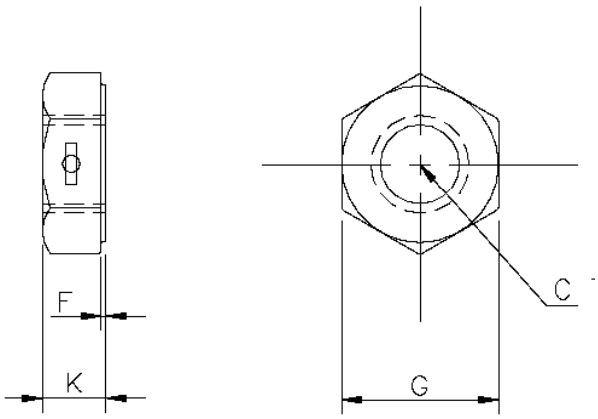
Overhead Conveyor Trolley Fasteners





Part Number	A	B	C	D	E	F	G	K	Type of Trolley Bracket
0031175	3/4"	5/16"	18 NC	1/4"	13/64"	1/64"	1/2"	3/16"	3" Forged & Stamped Zinc
0041115	1-1/2"	3/8"	16 NC	3/8"	15/64"	1/64"	9/16"	7/32"	4" Forged Horizontal
0041193	15/16"	3/8"	16 NC	5/16"	15/64"	1/64"	9/16"	7/32"	4" Forged Vertical
0061115	1-1/2"	1/2"	13 NC	1/2"	5/16"	1/64"	3/4"	5/16"	6" Forged Vertical 10" Drop
0061117	1-3/4"	1/2"	13 NC	1/2"	5/16"	1/64"	3/4"	5/16"	6" Forged 6" x 4" 10" Drop

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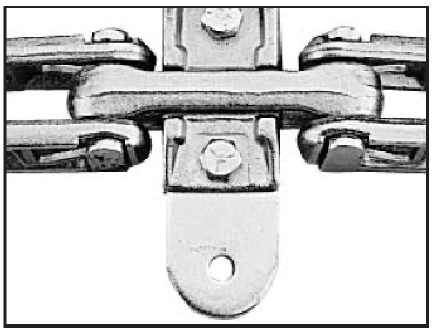
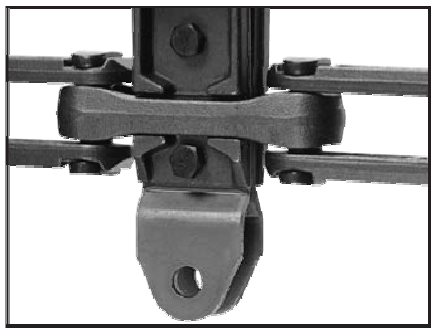
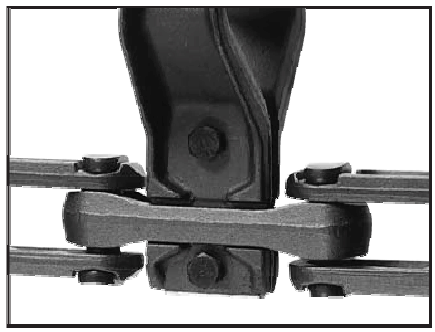
Trolley Attachments



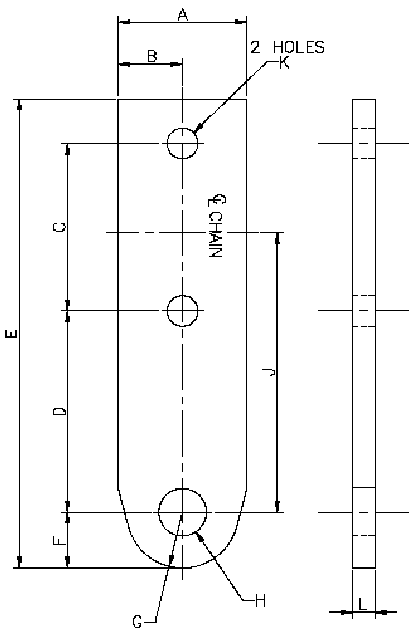
"C" Attachment

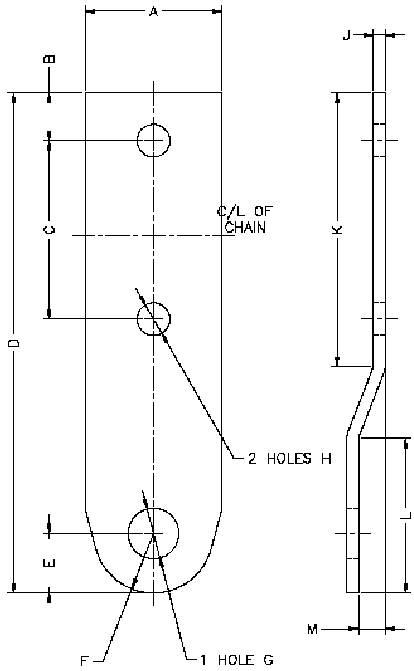


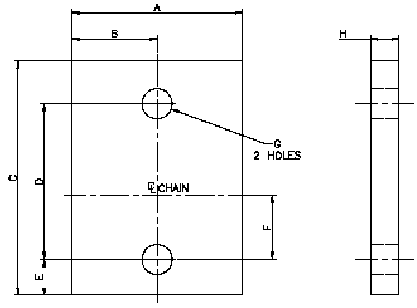
"H" Attachment



"I" Attachment







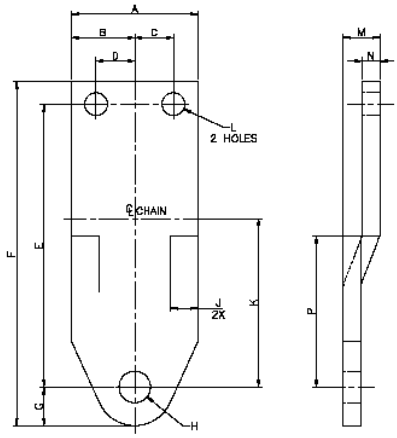
Part Number	3" 0600332	3" 0600335	4" 0600342	Part Number	3" 0600031	4" 0600041	6" 0600061	Part Number	3" 0600132	4" 0600142	6" 0600162
A	1.44	1.44	1.75	A	1.47	2	3	A	1.38	1.88	3
B	0.72	0.72	0.88	B	0.5	0.69	0.75	B	0.69	0.94	1.5
C	1.88	1.88	2.13	C	1.88	2.13	2.75	C	2.75	3	4.13
D	2.25	1.38	2.06	D	5.25	5.63	7	D	1.88	2.12	2.75
E	5.25	4.38	5.63	E	0.63	0.75	1	E	0.44	0.44	0.63
F	0.63	0.63	0.75	F	R.63	R.75	R 1	F	0.88	0.81	1.13
G	R.63	R.63	R1.63	G	0.53	0.53	0.81	G	0.34	0.41	0.53
H	0.53	0.53	0.56	H	0.34	0.41	0.53	H	0.24	0.38	0.5
J	3.13	2.25	2.88	J	0.13	0.18	0.25				
K	0.34	0.34	0.41	K	2.88	3.34	4				
L	0.25	0.25	0.38	L	1.62	1.75	2				
				M	0.28	0.38	0.41				

Note: Other Attachment sizes and styles available.

Information Courtesy of Frost Inc.

Trolley Attachments

“H” Attachment
Horizontal Hole



4"

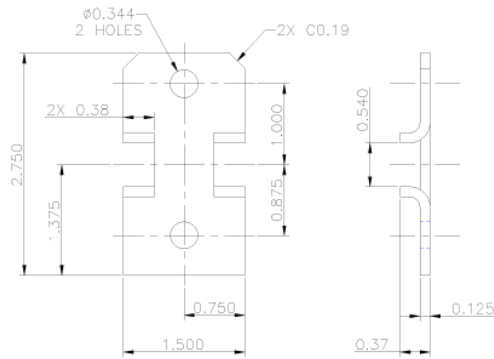
Part Number	A	B	C	D	E	F	G	H	J	K	L	M	N	P
0600038	2.25	1.13	0.68	0.68	5.03	6.13	0.69	0.56	0.5	3	0.41	0.66	0.31	2.69

6"

Part Number	A	B	C	D	E	F	G	H	J	K	L	M	N	P
0600065	2.25	1.13	0.68	0.68	4.57	6.13	0.81	0.81	0.5	2.88	0.53	0.66	0.31	2.56

“B” Attachment
with Nut & Cotter Pin

Part Number	3"	4"	6"
	0600236	0600246	0600263



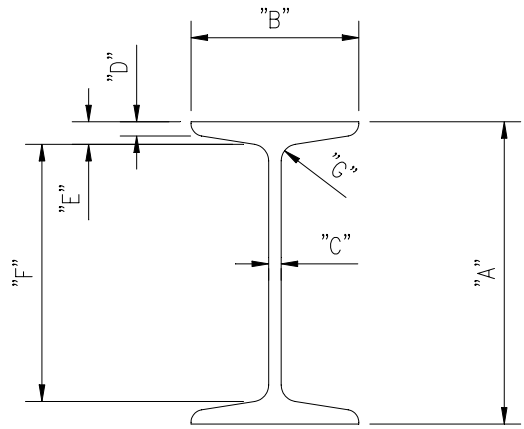
“F” Attachment
Chain Clip

Part Number	3"
	0600137

Information Courtesy of Frost Inc.

Overhead Conveyor I-Beam Track

The I-beam track realizes the entire load carried on an overhead trolley conveyor. The lower flange of the track must be hard and wear resistant to accommodate the trolleys wheels. The I-beam track generally limits the trolley loading capacity. The trolleys have the capacity for heavier loads but could peen or cause undue wear.



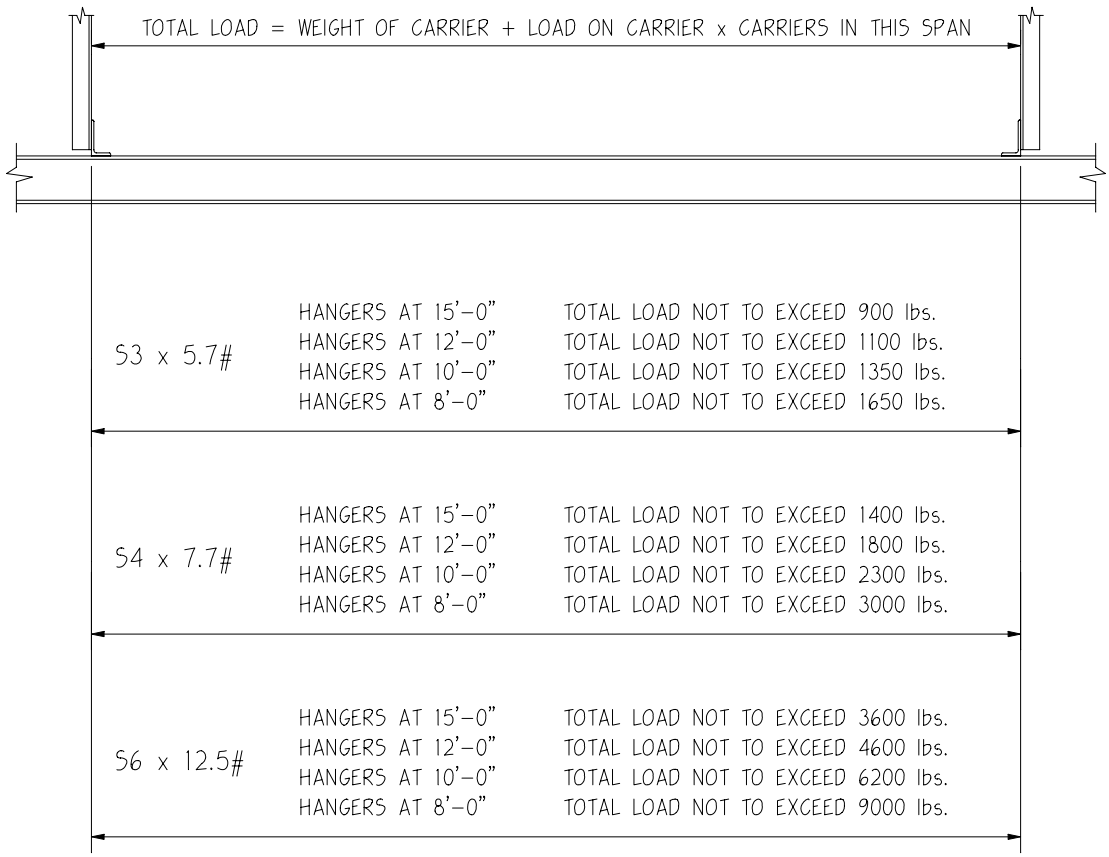
Dimensions and Weights of Conveyor Track									
Track Size	Material	Weight Per Ft.	A	B	C	D	E	F	G
3"	C-1045	5.7 lbs.	3"	2.33"	.170"	.170"	.350"	1.84"	.270"
4"	C-1045	7.7 lbs.	4"	2.66"	.190"	.190"	.396"	2.72"	.290"
6"	A-36	12.5 lbs.	6"	3.33"	.230"	.230"	.488"	4.47"	.330"

In order to assure a longer wear life, Handling Systems supplies a High Carbon Rail in the 3" and 4" standard structural shape. I-beam is stocked in 20 ft. lengths and can be cut to any length. Handling Systems can supply the Certified Material Test Reports upon request.

Chemical Properties:	
Carbon	0.43/0.50
Manganese	0.60/0.90
Phosphorus (Max.)	0.04
Sulphur (Max.)	0.05

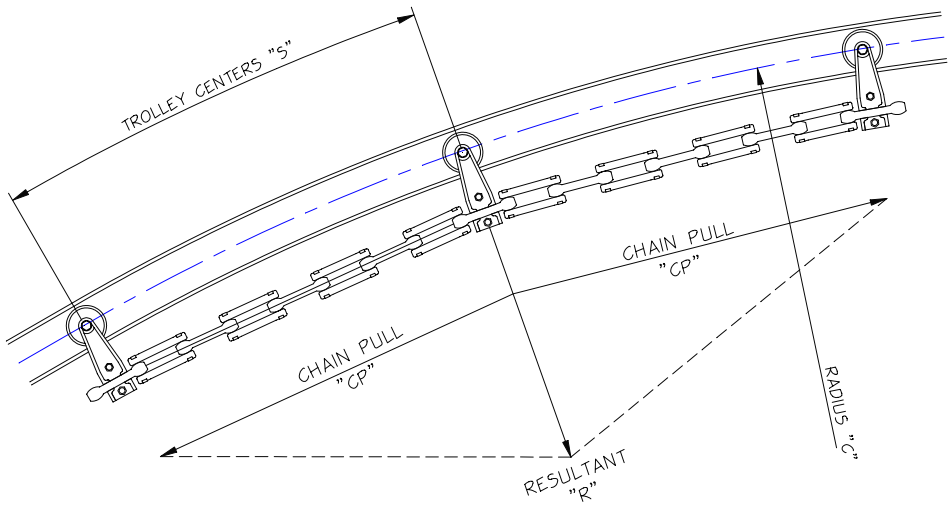
Mechanical Properties: (Approx. Only)	
Tensile Strength	91,000 psi
Yield Strength	77,000 psi
Elongation in 2"	12%
Reduction of Area	35%
Brinell Hardness	179
Machinability Rating	55%

Load Limits on I-Beam Track



Track Wear Rating

The allowable trolley loads and chain pull are directly related and limited by the track (I-Beam) load capacity. This track load capacity is known as “Track Wear Rating” (TWR), because loading above this limit will cause premature wear of the beam flanges at the trolley wheel contact point. Track loading is a combination of trolley loads (L) plus chain reaction loads (R).



At vertical curves, the chain exerts an additional force on the trolleys and the track flanges. This resultant(R) force acts toward the center of curvature of the vertical curve, and is additive to the force exerted by the trolley loads (L)…Live Load + Carrier…on the trolley wheels and track flanges. When selecting multiplane trolley conveyors consider these factors and make selections that keep the track flange loads within recommended limits.

CP = Allowable Chain Pull, lbs.

R = Resultant Chain reaction Loads, lbs.

L = Trolley Loads (Live Load + Carrier), lbs.

C = Vertical Curve Radius, ft.

S = Trolley Centers, in.

TWR = Track Wear Rating, lbs.

$R = (CP \times S)/12C$

$TWR > R + L$

The chain reaction loads (R) are a substantial portion of the TWR, in multiplane systems, reducing the allowable trolley live loads. The following chart is a general guide for the maximum “live load” of the Track Wear Rating (TWR).

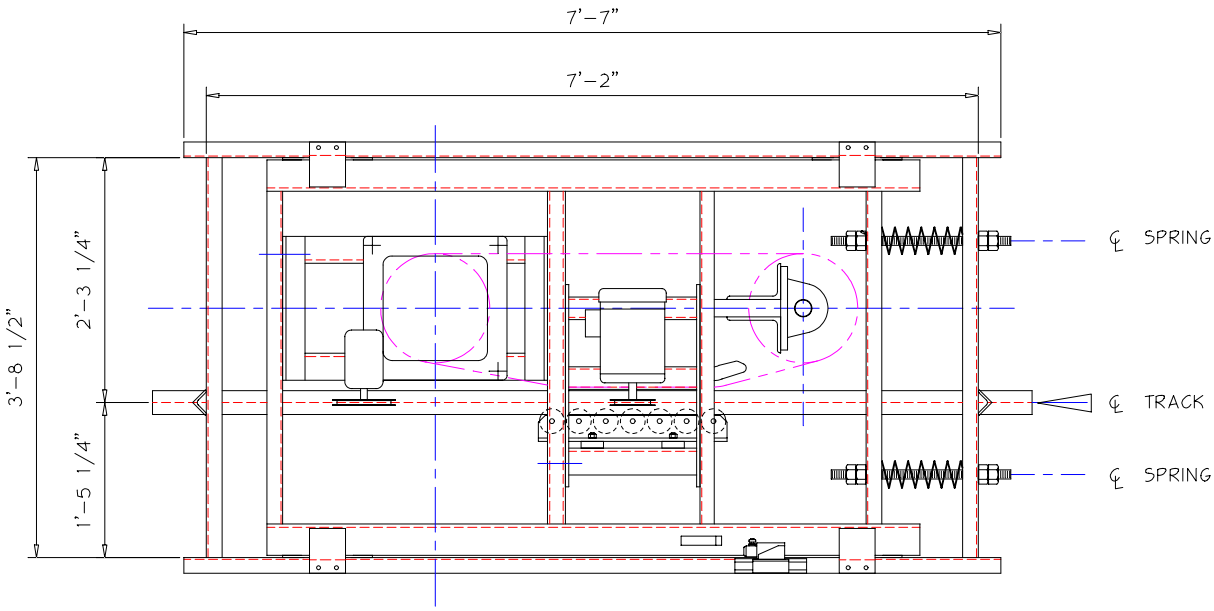
Trolley	Drop	TWR	Max. Load	Min. Spacing	Max. Spacing	I-Beam Size	Chain Size	Weight
3"	5 1/2"	450 lbs.	200 lbs.	6"	30"	3"	X-348	2.6 lbs.
4"	8" or 7 3/16"	800 lbs.	400 lbs.	8"	32"	4"	X-458	5.3 lbs.
6"	10"	1,600 lbs.	1,200 lbs.	12"	36"	6"	X-678	17.0 lbs.

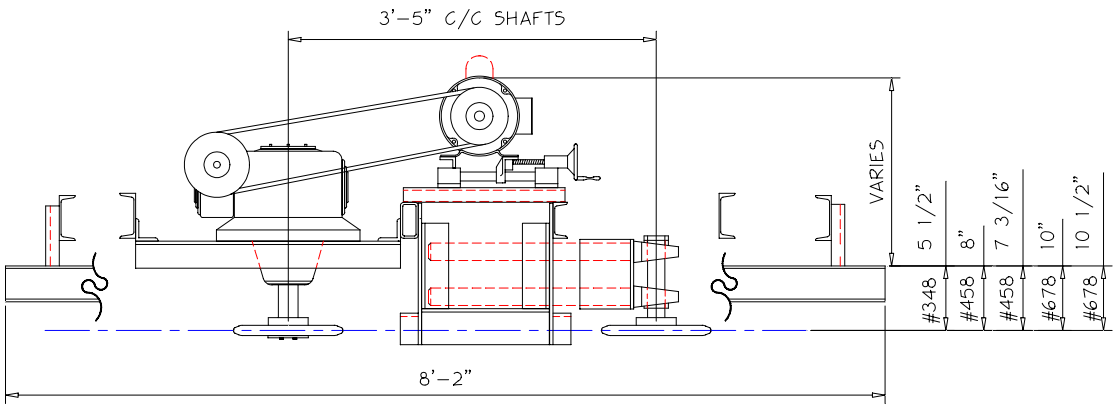
Overhead Conveyor Drives

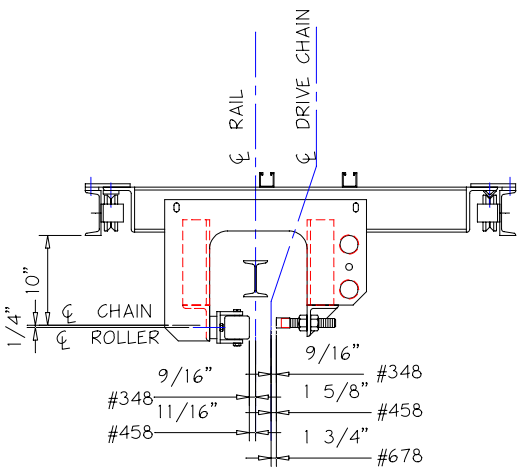
The muscle of your conveyor system is the drive unit. Conveyor drives are the most important component of the conveyor system. Handling Systems drive units are simple, heavy duty and dependable and are designed to provide a minimum of maintenance. HSC has two standard types of drive units available: Floating Caterpillar Drive and Sprocket Drive. There are multiple drive variations from these basic designs. Other drive types available per specific application are rotary drives, remote extended shaft drives (high temp. or wash down applications) and sprocket drive / take-up combination.

Each of these types of drives is available in constant speed or variable speed. Constant speed drives are limited to a fixed speed. A variation in speed of the drive can be accomplished in a couple of ways; one of which is to use a mechanical variable speed pulley that would give a speed range of 3 to 1. Another option is to control the speed electronically with a variable frequency drive.

Floating Caterpillar Drive

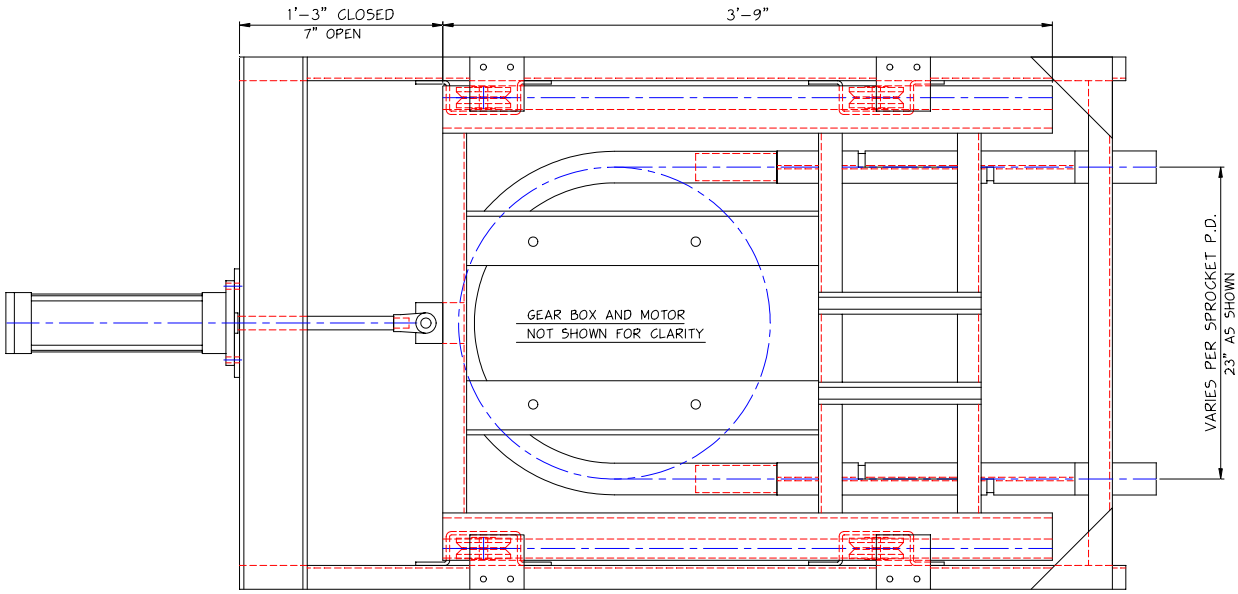


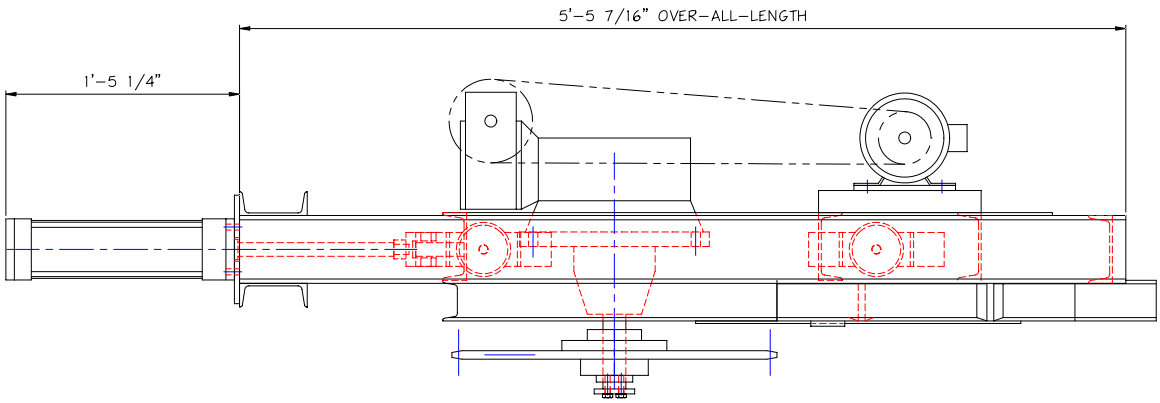




Caterpillar drives are the most common type of drives for overhead conveyors. They are located in a straight section of track, and if at all possible, the highest point of the system. The concept and design of this drive has been around for over 50 years. A caterpillar drive transmits its driving force to the conveyor by means of a caterpillar chain made of precision steel rollers with driving dogs that mesh with the links of the conveyor chain. A sprocket mounted directly to the output shaft of the gear reducer drives the caterpillar chain. All of which is mounted in a frame that is spring loaded to absorb instant shocks from jams or starting of the conveyor. Every drive is equipped with a limit switch to sense overload situations. The limit switch is typically wired directly into the emergency stop circuitry of the controls system. Handling Systems preloads every caterpillar drive according to the rated capacity and adjusts the sensor location at the factory.

Sprocket Drive





$$\text{MOTOR RPM} \times \frac{\text{MTR. SHEAVE P.D.}}{\text{RED. SHEAVE P.D.}} \times \frac{1}{\text{RED. RATIO}} \times \frac{\text{SPRKT. CIRC.}}{12} = \text{SPEED (FPM)}$$

SPEED FORMULA

Sprocket drives are simple and reliable but they do have some limitations. They should be used in smaller systems with lighter loads. They must be located in a horizontal turn of 180 degrees or 90 degrees. Each sprocket drive is equipped with a shear pin hub to protect against overload or conveyor jams. Sprocket drives are the most economical for smaller systems. In some cases it is feasible to incorporate an air operated take-up with a sprocket drive (as shown above).

Overhead Conveyor Drive Selection Chart for 1200 lbs.

Max. Chain Speed F.P.M.	Reducer Ratio	Drive No. 00-1200-3 00-1200-4 1200 lbs. Max. Ser. 4507	Reducer Input RPM
2		.33 - 1160	600
3		"	900
4	600:1	.50 - 1750	1200
5		"	1500
6		.50 - 1160	750
7		"	875
8		.75 - 1160	1000
9	250:1	.75 - 1750	1125
10		"	1250
12		1.0 - 1750	1500
15		"	937
18		1.5 - 1750	1125
20	125:1	"	1250
24		"	1500
25		"	1563
30		2.0 - 1750	1125
35		"	1312
40	75:1	"	1500
45		"	1685
50		"	1200
55		2.0 - 1750 (960# Pull)	1375
60	50:1	2.0 - 1750 (880# Pull)	1500
65		2.0 - 1750 (812# Pull)	1625
70		2.0 - 1750 (750# Pull)	1750

Unless noted otherwise, the HP and RPM of motor is shown in squares under drive numbers. The squares that also list chain pull indicates the maximum chain pull in relation to the maximum allowable input HP.

Overhead Conveyor Drive Selection
Chart 1800 lbs. to 3950 lbs.

Max. Chain Speed F.P.M.	Reducer Ratio	Drive No. 0-1800-3 0-1800-4 1800 lbs. Max. Ser. 5207	Drive No. 0-2200-3 0-2200-4 2200 lbs. Max. Ser. 5207	Drive No. 0-3000-4 0-3000-6 3000 lbs. Max. Ser. 6007	Drive No. 1-3950-6 3950 lbs. Max. Ser. 7007	Reducer Input RPM
2		.50 - 1160	.50 - 1160	.50 - 1160	.75 - 1160	504
3		"	"	.75 - 1160	1.0 - 1160	760
4	800:1	.75 - 1160	.75 - 1160	1.0 - 1160	"	1080
5		1.0 - 1750	1.0 - 1750	1.0 - 1750	1.5 - 1750	1250
6		"	"	1.5 - 1750	"	1520
7		.75 - 1160	1.0 - 1160	1.5 - 1160	2.0 - 1160	663
8		1.0 - 1160	"	"	"	756
9		"	"	"	"	852
10	300:1	"	"	2.0 - 1160	3.0 - 1160	948
12		1.5 - 1750	1.5 - 1750	2.0 - 1750	3.0 - 1750	1137
15		"	"	"	3.0 - 1750	1422
18		2.0 - 1750	2.0 - 1750	3.0 - 1750	3.0 - 1750	1704
20		2.0 - 1760	2.0 - 1760	"	5.0 - 1750	948
24		2.0 - 1750	2.0 - 1750	"	"	1138
25	150:1	"	2.0 - 1750 (2110# Pull)	"	"	1183
30		"	2.0 - 1750 (1760# Pull)	"	"	1422
35		2.0 - 1750 (1500# Pull)	2.0 - 1750 (1500# Pull)	5.0 - 1750	7.5 - 1750	1657
40		3.0 - 1750 (1980# Pull)	3.0 - 1750 (1925# Pull)	5.0 - 1750 (2900# Pull)	"	948
45		3.0 - 1750 (1760# Pull)	3.0 - 1750 (1760# Pull)	5.0 - 1750 (2750# Pull)	"	1066
50		3.0 - 1750 (1600# Pull)	3.0 - 1750 (1600# Pull)	5.0 - 1750 (2600# Pull)	"	1193
55	75:1	3.0 - 1750 (1440# Pull)	3.0 - 1750 (1440# Pull)	5.0 - 1750 (2400# Pull)	7.5 - 1750 (3500# Pull)	1303
60		3.0 - 1750 (1320# Pull)	3.0 - 1750 (1320# Pull)	5.0 - 1750 (2200# Pull)	10.0 - 1750 (3425# Pull)	1422
65		3.0 - 1750 (1220# Pull)	3.0 - 1750 (1220# Pull)	5.0 - 1750 (2000# Pull)	10.0 - 1750 (3300# Pull)	1530
70		3.0 - 1750 (1130# Pull)	3.0 - 1750 (1130# Pull)	5.0 - 1750 (1900# Pull)	10.0 - 1750 (3150# Pull)	1657

Unless noted otherwise, the HP and RPM of motor is shown in squares under drive numbers. The squares that also list chain pull indicates the maximum chain pull in relation to the maximum allowable input HP.

Sprocket Drive Selection Chart For:
12Tooth, X-348 (3”I) Sprocket 23” P.D.
9Tooth X-458 (4”I) Sprocket 23 ¼” P.D.

Speed FPM	Ratio	4507		Input RPM
		Chain Pull (lbs.)	Motor HP - RPM	
6	600:1	680	.5 - 1150	600
8		670	.5 - 1150	800
10		670	.5 - 1750	1000
12		670	.75 - 1750	1800
15		660	"	1500
18	250:1	630	.75 - 1150	750
20		630	"	834
24		620	1.0 - 1750	1000
25		620	"	1042
30		610	"	1250
35		610	"	1458
40		610	1.5 - 1750	1667
45	125:1	610	"	938
50		600	"	1042
55		600	"	1145
60		590	2.0 - 1750	1250
70		580	"	1416
75		570	"	1562
80	75:1	560	"	1000
90		520	"	1125
100		490	"	1250

Series 4507 Gear Reducer

Sprocket Drive Selection Chart For:
12Tooth, X-348 (3”I) Sprocket 23” P.D.
9Tooth X-458 (4”I) Sprocket 23 ¼” P.D.

Speed FPM	Ratio	5207		6007		7007		Input RPM
		Chain Pull (lbs.)	Motor HP - RPM	Chain Pull (lbs.)	Motor HP - RPM	Chain Pull (lbs.)	Motor HP - RPM	
5	600:1	1230	.5 - 1150	2000	.75 - 1150	2670	1.0 - 1150	672
6		1225	.75 - 1150	"	1.0 - 1150	"	1.5 - 1150	800
8		1220	.75 - 1750	"	1.0 - 1750	"	"	1072
10		1215	"	"	1.5 - 1750	"	1.5 - 1150	1336
12		1210	1.0 - 1750	"	"	"	2.0 - 1750	1600
15	300:1	1205	1.0 - 1150	"	2.0 - 1150	"	3.0 - 1150	750
18		1200	1.0 - 1750	"	2.0 - 1750	"	3.0 - 1750	900
20		1190	1.5 - 1750	"	"	"	"	1000
24		1190	"	1980	3.0 - 1750	"	"	1200
25		1180	"	1950	"	"	"	1251
30		1180	2.0 - 1750	1920	"	"	5.0 - 1750	1500
35		1170	"	1890	"	"	"	1750
40	150:1	1120	"	2000	5.0 - 1750	"	"	1000
45		1120	3.0 - 1750	1850	"	"	"	1125
50		1060	"	1745	"	2650	7.5 - 1750	1251
55		1005	"	1630	"	2570	"	1375
60		955	"	1510	"	2490	"	1500
65		890	"	1400	"	2400	"	1625
70	75:1	1090	"	1600	"	2600	"	875
80		1080	"	1480	"	2410	10.0 - 1750	1000
90		1070	"	1360	"	2220	"	1125
100		1050	"	1250	7.5 - 1750	2000	"	1250

Sprocket Drive Selection Chart For:
19Tooth, X-348 (3”I) Sprocket 36 3/8” P.D.
14Tooth, X-458 (4”I) Sprocket 36” P.D.
10Tooth, X-678 (6”I) Sprocket 38 ½” P.D.

Speed FPM	Ratio	4507		Input RPM
		Chain Pull (lbs.)	Motor HP - RPM	
9		434	.5 - 1150	600
10		432	.5 - 1150	667
12		431	"	800
15	600:1	431	.5 - 1750	1000
18		431	.75 - 1750	1200
20		430	"	1338
24		426	"	1600
25		406	.75 - 1150	695
30		404	"	835
35		402	1.0 - 1750	970
40		400	"	1112
45	250:1	397	"	1250
50		395	1.5 - 1750	1390
55		392	"	1527
60		390	"	1667
70		390	"	959
80		385	2.0 - 1750	1110
90	125:1	380	"	1250
100		360	"	1388

Sprocket Drive Selection Chart For:
19Tooth, X-348 (3”I) Sprocket 36 3/8” P.D.
14Tooth, X-458 (4”I) Sprocket 36” P.D.
10Tooth, X-678 (6”I) Sprocket 38 ½” P.D.

Speed FPM	Ratio	5207		6007		7007		Input RPM
		Chain Pull (lbs.)	Motor HP - RPM	Chain Pull (lbs.)	Motor HP - RPM	Chain Pull (lbs.)	Motor HP - RPM	
7		787	.5 - 1150	1270	.75 - 1150	1705	1.0 - 1150	616
8		786	.5 - 1150	"	"	"	"	704
9		785	"	"	1.0 - 1150	"	1.5 - 1150	800
10	800:1	783	.75 - 1750	"	1.0 - 1750	"	1.5 - 1750	976
12		780	"	"	"	"	"	1070
15		777	"	1268	1.5 - 1750	"	"	1336
18		775	1.0 - 1750	1266	"	"	2.0 - 1750	1600
20		777	1.0 - 1150	"	1.5 - 1150	"	2.0 - 1150	666
24		774	1.5 - 1150	"	"	"	"	800
25		772	"	"	2.0 - 1150	"	3.0 - 1150	831
30		768	1.5 - 1750	"	2.0 - 1750	"	3.0 - 1750	999
35	300:1	763	"	1260	3.0 - 1750	"	"	1164
40		758	"	1242	"	"	"	1332
45		753	2.0 - 1750	1224	"	"	5.0 - 1750	1500
50		748	"	1205	"	"	"	1665
55		783	"	1270	"	"	"	917
60		758	3.0 - 1750	1195	"	"	"	1000
70	150:1	702	"	1120	5.0 - 1750	"	7.5 - 1750	1150
80		656	"	1045	"	1640	"	1332
90		608	"	970	"	1570	"	1500
100		560	"	890	"	1504	"	1728

Overhead Conveyor Take-Up Assembly

Take-ups in overhead conveyor systems are a necessity for proper conveyor operation. They are designed to provide a means for removing excess chain slack. Conveyor chain will wear and stretch over time creating excess chain length.

A typical design for take-up assemblies consist of a fixed outer frame and moveable inner frame. The inner frame is mounted on guided v-groove wheels. A horizontal turn, either a roller turn or a traction wheel turn, is mounted in the inner frame and an expansion section in the conveyor track. The inner frame rolls within the outer frame and is designed to take out excess chain slack. The amount of slack that a take-up is capable of removing is dependant on the size of the expansion section (take-up sleeves).

There are two basic types of take-ups for overhead conveyors: manual and automatic.

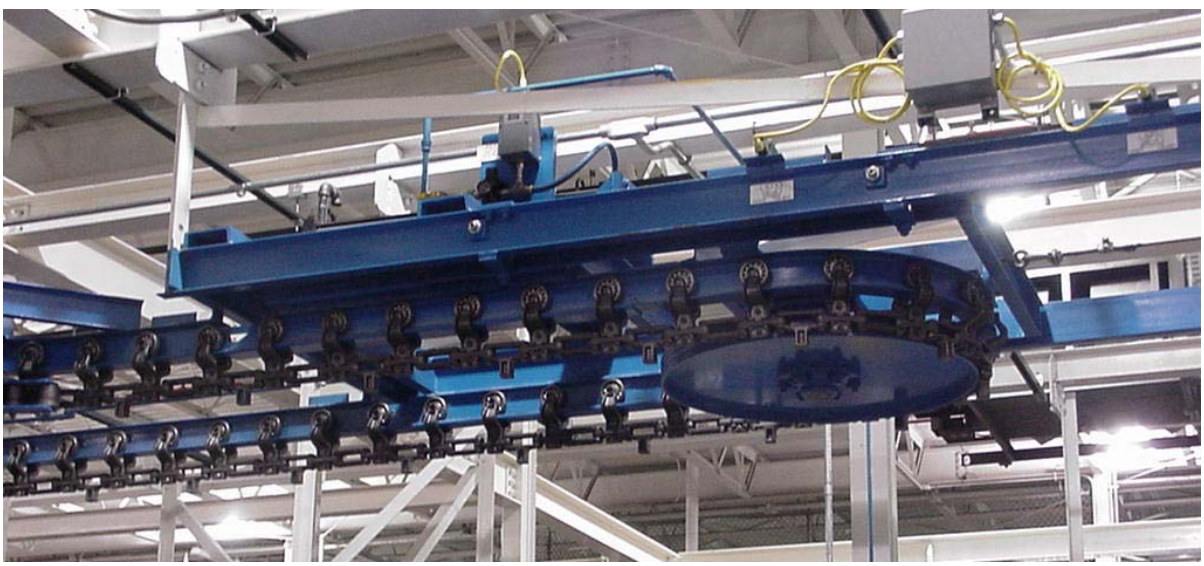
Manual take-ups (screw type) require more maintenance but they have a lower initial cost. Additional maintenance is required to manually adjust the chain tension each time an excessive amount of slack is created in the conveyor chain. Manual take-ups can be located any where in the system and they are most used when the conveyor drive cannot be located at a high point just prior to a decline.

Automatic take-ups are available in either spring or air operated.

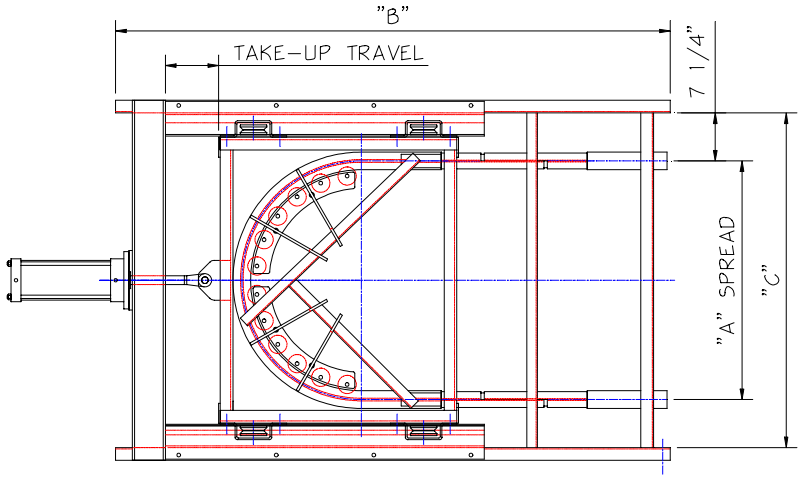
The spring take-up is the most economical and is similar to the screw type except heavy coil springs replace the screws. Spring type take-ups are most commonly used in shorter, lower chain pull, non-reversing systems. The tension applied to the chain by the springs will vary depending on the amount of spring compression. In some systems, this could lead to a surge in the conveyor.

Air operated take-ups are recommended for conveyors that require a constant tension. The tension in an air-operated take-up can be easily adjusted at any time by regulating the air pressure supplied to the cylinder. The pressure setting of the regulator will depend on several parameters of the system and will sometimes require a few adjustments at the start up of the system. They are most advantageous when the take-up cannot be located close to the drive unit.

Special designed take-ups are sometimes necessary to accommodate the system parameters. Extended spread take-ups and 90 degree corner take-ups are common.



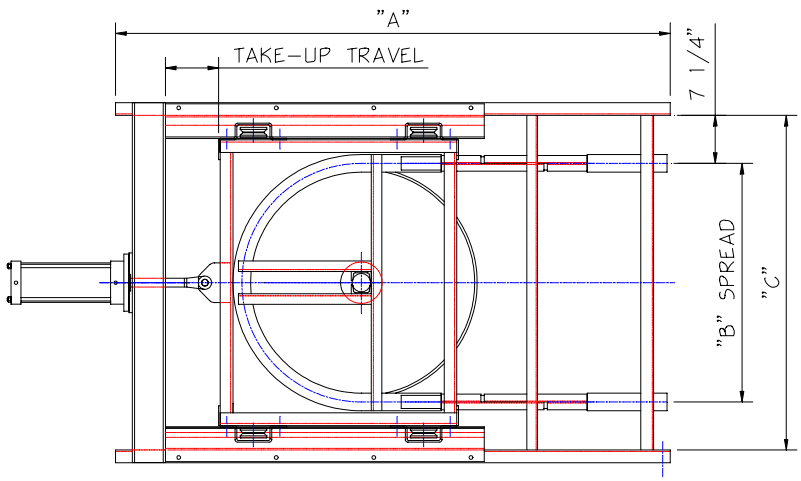
Overhead Conveyor Take-Up Assembly



AIR OPERATED – ROLLER TURN TYPE – TAKE UP ASSEMBLY

SIZE	"A" SPREAD	TAKE UP	"B"	"C"	DROP
348	VARIES	8,12,16,24	TAKE UP + SPREAD + 5'-0"	"A" + 14 1/2"	5 1/2"
458	VARIES	8,12,16,24	TAKE UP + SPREAD + 5'-0"	"A" + 14 1/2"	7 3/16" OR 8"
678	VARIES	8,12,16,24	TAKE UP + SPREAD + 5'-0"	"A" + 14 1/2"	10"

ALL DIMENSIONS ARE APPROXIMATE ONLY

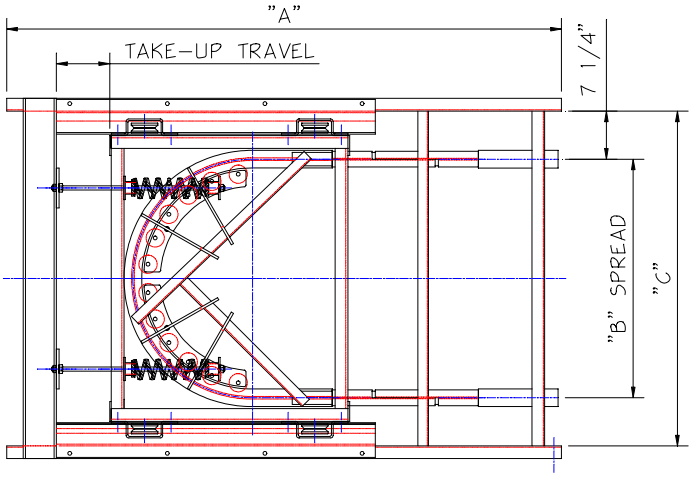


AIR OPERATED – TRACTION WHEEL TYPE – TAKE UP ASSEMBLY

SIZE	"A" SPREAD	TAKE UP	"B"	"C"	DROP
348	VARIES	8,12,16,24	TAKE UP + SPREAD + 5'-0"	"A" + 14 1/2"	5 1/2"
458	VARIES	8,12,16,24	TAKE UP + SPREAD + 5'-0"	"A" + 14 1/2"	7 3/16" OR 8"
678	VARIES	8,12,16,24	TAKE UP + SPREAD + 5'-0"	"A" + 14 1/2"	10"

ALL DIMENSIONS ARE APPROXIMATE ONLY

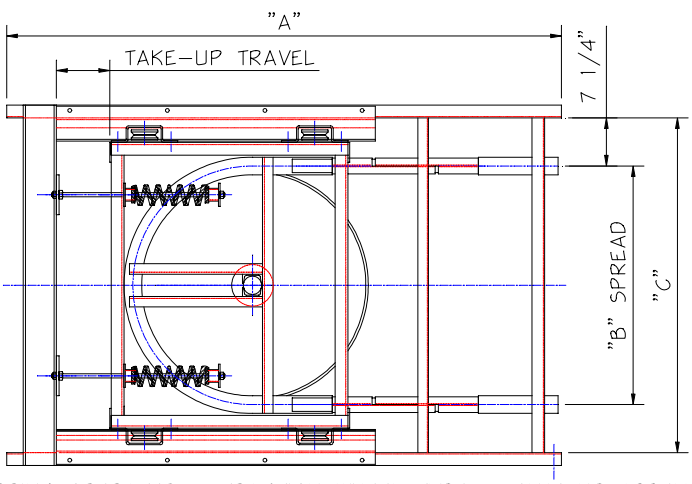
Overhead Conveyor Take-Up Assembly



SPRING OPERATED – ROLLER TURN TYPE – TAKE UP ASSEMBLY

SIZE	"A" SPREAD	TAKE UP	"B"	"C"	DROP
348	VARIES	8,12,16,24	TAKE UP + SPREAD + 4'-9"	"A" + 14 1/2"	5 1/2"
458	VARIES	8,12,16,24	TAKE UP + SPREAD + 4'-9"	"A" + 14 1/2"	7 3/16" OR 8"
678	VARIES	8,12,16,24	TAKE UP + SPREAD + 4'-9"	"A" + 14 1/2"	10"

ALL DIMENSIONS ARE APPROXIMATE ONLY

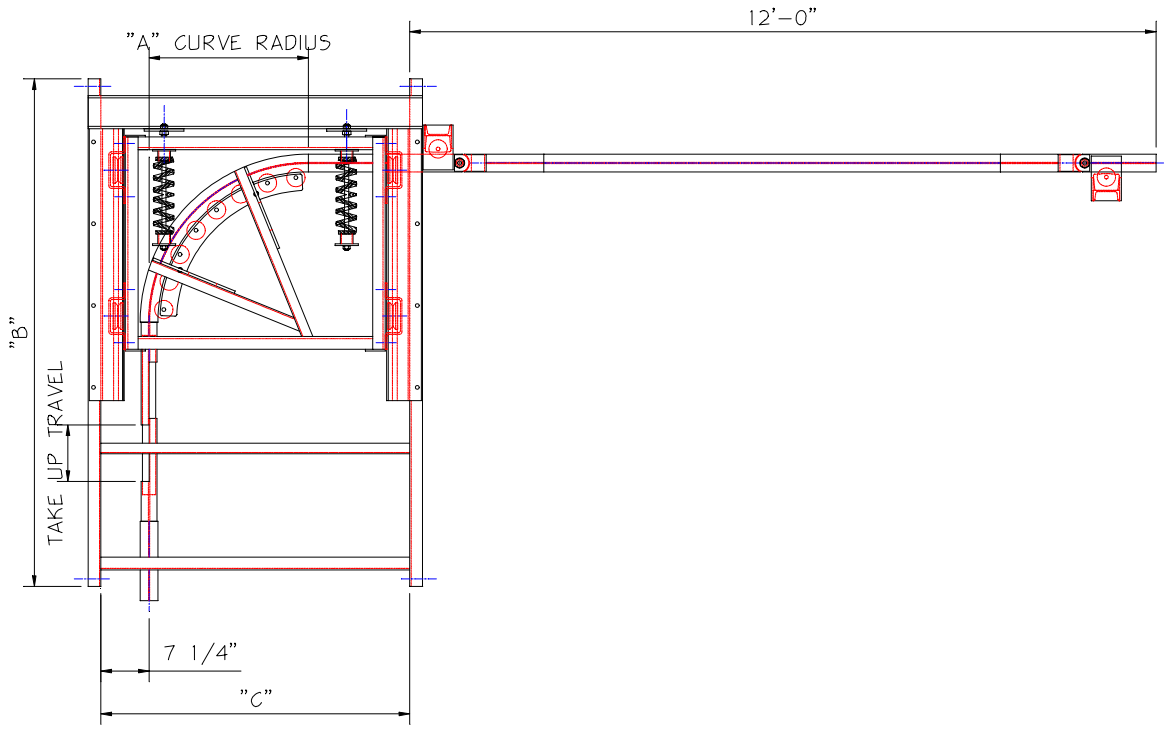


SPRING OPERATED – TRACTION WHEEL TYPE – TAKE UP ASSEMBLY

SIZE	"A" SPREAD	TAKE UP	"B"	"C"	DROP
348	VARIES	8,12,16,24	TAKE UP + SPREAD + 4'-9"	"A" + 14 1/2"	5 1/2"
458	VARIES	8,12,16,24	TAKE UP + SPREAD + 4'-9"	"A" + 14 1/2"	7 3/16" OR 8"
678	VARIES	8,12,16,24	TAKE UP + SPREAD + 4'-9"	"A" + 14 1/2"	10"

ALL DIMENSIONS ARE APPROXIMATE ONLY

Overhead Conveyor Take-Up Assembly

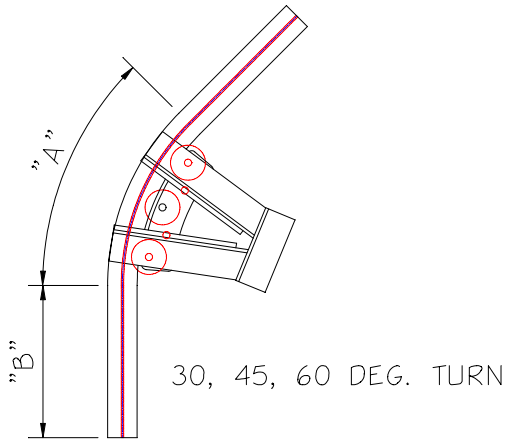


SPRING OPERATED – ROLLER TURN TYPE – 90 DEG. TAKE UP ASSEMBLY

SIZE	"A" CURVE RADIUS	TAKE UP	"B"	"C"	DROP
348	VARIES	8"	TAKE UP + "A" + 40"	"A" + 23"	5 1/2"
458	VARIES	8"	TAKE UP + "A" + 40"	"A" + 23"	7 3/16" OR 8"
678	VARIES	8"	TAKE UP + "A" + 40"	"A" + 23"	10"

ALL DIMENSIONS ARE APPROXIMATE ONLY

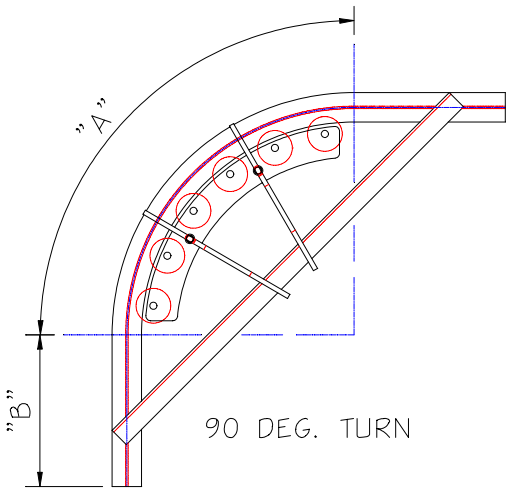
Horizontal Roller Turns

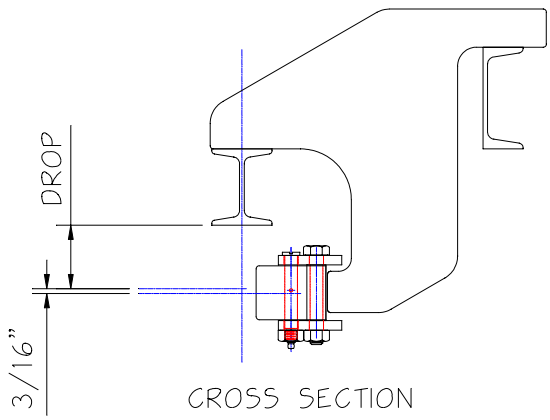


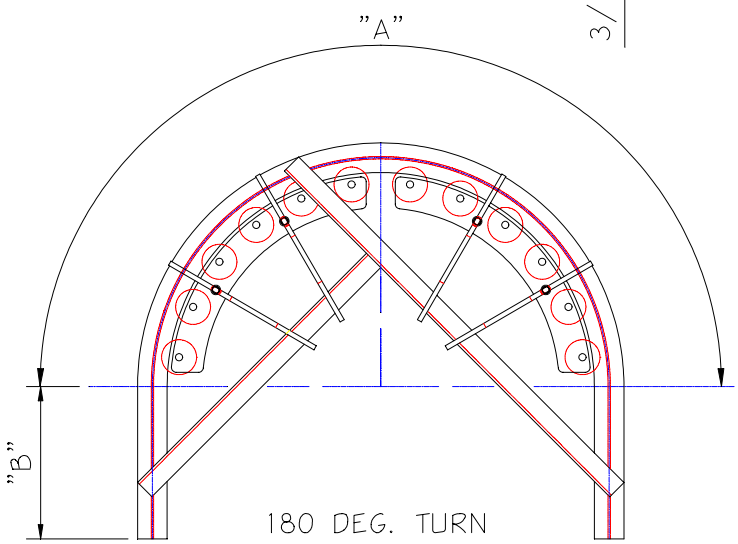
Handling Systems provides standard horizontal roller turn assemblies in 30, 45, 60, 90 and 180-degree segments and radii listed on the chart. Special degree and radius segments are available per application.

Normally, roller turns are the most economical means for providing radial support to overhead conveyor chains around a horizontal turn. Due to the low initial cost they are widely used and provide a positive performance in most conveyor applications.

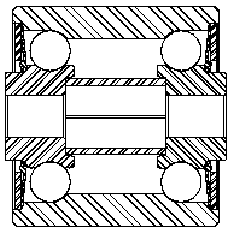
Roller turns are fabricated with high carbon rail, laser cut brackets and segment bars for excellent accuracy. Each curve is assembled and welded in a precision jig. The rollers are mounted on close centers, nominally 4 to 4 ½" centers. Each roller may be replaced individually or the whole segment may be unbolted and replaced as a unit.





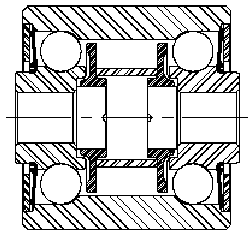


Roller Turn Rollers



Style 1

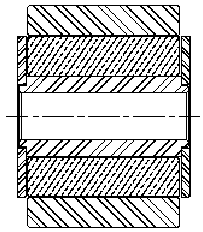
Low cost, standard roller with fully contoured inner raceways. Nitrile contact seal (300°F capable) is also purgeable, so unit can be used as sealed-for-life or for relube applications.



Style 2

Same basic construction of Style 1, with added features of patented* grease retaining rings and grease injection system (assures uniform lube distribution to both upper and lower raceways).

* Patent No. 4,408,808



Style 3

Our journal type bearing is specially designed for high heat applications and oven operations. Heat capacity up to 800°F/427°C continuous operation.

Standard 3,4 and 6 Inch Roller Dimensions

Style 1 Part Number	Style 2 Part Number	Outer Diameter	Bore Diameter	Outer Race Length	Overall Length	Extension	Extension Diameter	Load Rating	Bearing Style
0300100	0430000	2.75	.50	1.69	1.87	.09	1.14	2,400	Standard Full Ball
0304800		2.75	.63	1.94	2.13	.09	1.14	2,400	Standard Full Ball
0305100	0431000	2.75	.50	1.94	2.13	.09	1.14	2,400	Standard Full Ball
0305700	0432000	2.75	.56	1.94	2.13	.09	1.14	2,400	Standard Full Ball
0405100	0441000	2.75	.50	2.56	2.75	.09	1.14	2,400	Standard Full Ball
0405700	0442000	2.75	.56	2.56	2.75	.09	1.14	2,400	Standard Full Ball
0407200	0443000	2.75	.63	2.56	2.75	.09	1.14	2,400	Standard Full Ball
0414600	0463100	3.00	.63	2.56	2.75	.09	1.14	2,400	Standard Full Ball
0407000		2.75	.75	2.56	2.75	.09	1.14	2,400	Standard Full Ball

Special Heavy-Duty Rollers

Part Number	Outer Diameter	Bore Diameter	Outer Race Length	Overall Length	Extension	Extension Diameter	Load Rating	Bearing Style
0404620	3.00	.50	2.63	2.75	.06	1.25	3,200	5/8" Diameter Ball
**0404600	3.00	.63	2.63	2.75	.06	1.25	3,200	5/8" Diameter Ball
0404650	3.00	.75	2.63	2.75	.06	1.25	3,200	5/8" Diameter Ball
0404660	3.00	.69	2.63	2.75	.06	1.25	3,200	5/8" Diameter Ball
0404900	3.00	.63	2.63	2.75	.06	1.25	3,200	5/8" Diameter Ball FTT Seal

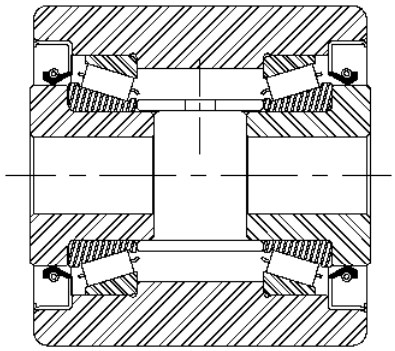
** 0463100 is alternate

Style 3 High Temperature Rollers

Part Number	Outer Diameter	Bore Diameter	Outer Race Length	Overall Length	Extension	Extension Diameter	Load Rating	Bearing Style
0412000	2.75	.57	1.88	2.13	.25	1.00	2,200	High-Temp.Journal
0412500	2.75	.51	1.88	2.13	.13	1.00	2,200	High-Temp.Journal
0413000	2.75	.57	2.5	2.75	.13	1.00	2,200	High-Temp.Journal
0413500	2.75	.51	2.5	2.75	.13	1.00	2,200	High-Temp.Journal
0413520	2.75	.63	2.5	2.75	.13	1.00	2,200	High-Temp.Journal

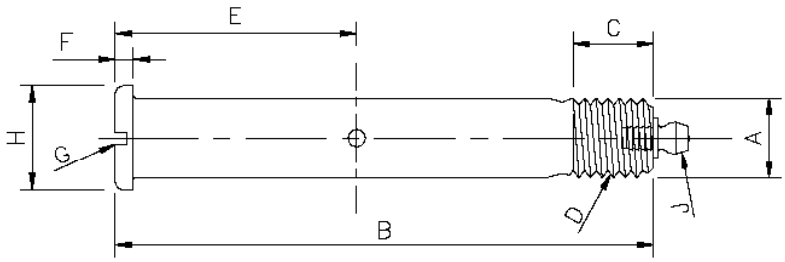
Information Courtesy of Frost Ins.

Roller Turn Rollers & Bolts



Heavy-Duty Roller Turn Rollers

Part Number	Outer Diameter	Bore Diameter	Outer Race Length	Overall Length	Hub Extension	Extension Diameter	Load Rating	Bearing Style
0404000	2.81	.63	2.75	2.81	.03	1.5	Consult Factory	Heavy Duty
0404050	2.81	.75	2.75	2.81	.03	1.5	Consult Factory	Heavy Duty
0404200	2.81	.63	2.75	2.75	.03	1.5	Consult Factory	Heavy Duty



3-Inch Roller Bolt

Standard Bolt Number	A	B	C	D	E	F	G	H
0300708	.500	3.500	.50	1/2-13NC	1.500	.125	3/32 x 3/32	.687
0300308	.500	3.3	.50	1/2-13NC	1.500	.125	3/32 x 3/32	.687

4 & 6 Inch Roller Bolt

Standard Bolt Number	A	B	C	D	E	F	G	H
0400308	.500	4.156	.750	1/2-13NC	1.875	.125	3/32 x 3/32	.812
0401261	.562	4.187	.625	9/16-12NC	2.062	.125	3/32 x 3/32	.750
0425505	.625	4.156	.500	5/8-11NC	1.875	.125	3/32 x 3/32	.812
0402705	.750	4.562	1.00	3/4-10NC	1.812	.312	1/8 x 1/8	1.125
* 0425310	.625	6.125	1.00	5/8-11NC	NA	.500	NA	1.00

* Non-relubable type bolt.

Consult factory for different grease fitting configurations.

Information Courtesy of Frost Ins.

3” Roller Turn Assembly Part No.’s & Dimensions

Description			Dimensions		
Rad. (in.)	Deg. Turn	348 Part No.	348 "A"	348 "B"	348 No. RTR
18"	30	3RT1830	9 3/8"	1'-0"	3
	45	3RT1824	1'-2"	1'-0"	3
	60	3RT1860	1'-6 3/4"	1'-0"	4
	90	3RT1890	2'-4 1/16"	1'-6"	6
	180	3RT18180	4'-8 3/16"	1'-0"	12
24"	30	3RT2430	1'-0 1/2"	1'-0"	3
	45	3RT2445	1'-6 3/4"	1'-0"	4
	60	3RT2460	2'-1"	1'-7 7/16"	6
	90	3RT2490	3'-1 1/2"	1'-4"	8
	180	3RT24180	6'-3"	1'-0"	16
30"	30	3RT3030	1'-3 5/8"	1'-0"	4
	45	3RT3045	1'-11 7/16"	1'-0"	5
	60	3RT3060	2'-7 1/4"	1'-0"	7
	90	3RT3090	3'-10 15/16"	1'-0"	10
	180	3RT30180	7'-9 1/8"	1'-0"	20
36"	30	3RT3630	1'-6 3/4"	1'-0"	4
	45	3RT3645	2'-4 3/16"	1'-0"	6
	60	3RT3660	3'-1 9/16"	1'-0"	9
	90	3RT3690	4'-8 3/8"	1'-0"	12
	180	3RT36180	9'-4 11/16"	1'-0"	24
42"	30	3RT4230	1'-9 15/16"	1'-0"	5
	45	3RT4245	2'-8 7/8"	1'-3"	7
	60	3RT4260	3'-7"	1'-0"	10
	90	3RT4290	5'-5 3/4"	1'-3"	14
	180	3RT42180	10'-11 9/16"	1'-0"	28
48"	30	3RT4830	2'-1 1/16"	1'-0"	6
	45	3RT4845	3'-1 5/8"	1'-0"	8
	60	3RT4860	4'-2 1/8"	1'-0"	12
	90	3RT4890	6'-3 5/16"	1'-6"	16
	180	3RT48180	12'-6 7/16"	1'-0"	32
60"	30	3RT6030	2'-7 3/8"	2'-0"	7
	45	3RT6045	3'-11"	2'-0"	10
	60	3RT6060	5'-2 11/16"	2'-0"	14
	90	3RT6090	7'-10 1/16"	2'-0"	20
	180	3RT60180	15'- 8 1/8"	1'-0"	40
72"	90	3RT7290	9'-4 15/16"	2'-3"	24
	180	3RT72180	18'-4 13/16"	1'-0"	48

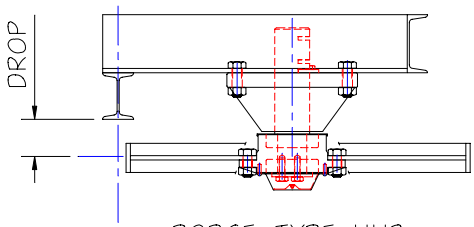
4” Roller Turn Assembly Part No.’s & Dimensions

Description			Dimensions		
Rad. (in.)	Deg. Turn	458 Part No.	458 "A"	458 "B"	458 No. RTR
18"	30	4RT1830	9 7/16"	1'-0"	3
	45	4RT1824	1'-2 1/8"	1'-0"	3
	60	4RT1860	1'-6 7/8"	1'-0"	4
	90	4RT1890	2'-4 1/4"	1'-6"	6
	180	4RT18180	4'-8 9/16"	1'-0"	12
24"	30	4RT2430	1'-0 9/16"	1'-0"	3
	45	4RT2445	1'-6 7/8"	1'-0"	4
	60	4RT2460	2'-1 1/8"	1'-0"	6
	90	4RT2490	3'-1 11/16"	1'-6"	8
	180	4RT24180	6'-3 7/16"	1'-0"	16
30"	30	4RT3030	1'-3 11/16"	1'-0"	4
	45	4RT3045	1'-11 9/16"	1'-0 3/16"	5
	60	4RT3060	2'-7 7/16"	1'-0"	7
	90	4RT3090	3'-11 1/8"	1'-0"	10
	180	4RT30180	7'-10 1/4"	1'-0"	20
36"	30	4RT3630	1'-6 7/8"	1'-0"	4
	45	4RT3645	2'-4 1/4"	1'-0"	6
	60	4RT3660	3'-1 11/16"	1'-0"	9
	90	4RT3690	4'-8 9/16"	1'-0"	12
	180	4RT36180	9'-5 1/8"	1'-0"	24
42"	30	4RT4230	1'-10"	1'-0"	5
	45	4RT4245	2'-9"	1'-0"	7
	60	4RT4260	3'-8"	1'-0"	10
	90	4RT4290	5'-6"	1'-0"	14
	180	4RT42180	11'-0"	1'-3"	28
48"	30	4RT4830	2'-1 1/8"	1'-0"	6
	45	4RT4845	3'-11 1/16"	1'-0"	8
	60	4RT4860	4'-2 1/4"	1'-6"	12
	90	4RT4890	6'-3 3/8"	1'-6"	16
	180	4RT48180	12'-6 13/16"	1'-0"	32
60"	30	4RT6030	2'-7 7/16"	1'-0"	7
	45	4RT6045	3'-11 1/8"	1'-0"	10
	60	4RT6060	5'-2 13/16"	1'-0"	14
	90	4RT6090	7'-10 1/4"	1'-0"	20
	180	4RT60180	15'-8 1/2"	1'-0"	40
72"	90	4RT7290	9'-5 1/8"	1'-6"	24
	180	4RT72180	18'-10 1/4"	1'-0"	48

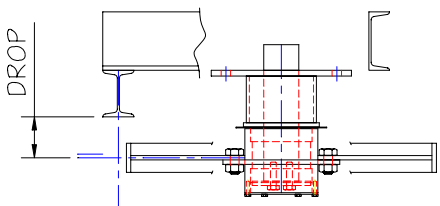
6” Roller Turn Assembly Part No.’s & Dimensions

Description			Dimensions		
Rad. (in.)	Deg. Turn	678 Part No.	678 "A"	678 "B"	678 No. RTR
18"	30		-	-	-
	45		-	-	-
	60		-	-	-
	90		-	-	-
	180		-	-	-
24"	30		-	-	-
	45		-	-	-
	60		-	-	-
	90		-	-	-
	180		-	-	-
30"	30	6RT3030	1'-3 7/8"	1'-0"	4
	45	6RT3045	1'-11 7/8"	1'-0"	5
	60	6RT3060	2'-7 13/16"	1'-0"	7
	90	6RT3090	3'-11 3/4"	1'-0"	10
	180	6RT30180	7'-11 7/16"	1'-0"	20
36"	30	6RT3630	1'-7 1/16"	1'-0"	4
	45	6RT3645	2'-4 9/16"	1'-0"	6
	60	6RT3660	3'-2 1/16"	1'-0"	9
	90	6RT3690	4'-9 1/8"	1'-6"	12
	180	6RT36180	9'-6 5/16"	1'-6"	24
42"	30	6RT4230	1'-10 3/16"	1'-0"	5
	45	6RT4245	2'-9 1/4"	1'-0"	7
	60	6RT4260	3'-8 3/8"	1'-0"	10
	90	6RT4290	5'-6 9/16"	1'-0"	14
	180	6RT42180	11'-1 1/8"	1'-0"	28
48"	30	6RT4830	2'-1 5/16"	1'-6"	6
	45	6RT4845	3'-2"	1'-6"	8
	60	6RT4860	4'-2 5/8"	1'-6"	12
	90	6RT4890	6'-4"	1'-6"	16
	180	6RT48180	12'-8"	1'-0"	32
60"	30	6RT6030	2'-7 5/8"	1'-6"	7
	45	6RT6045	3'-11 3/8"	1'-6"	10
	60	6RT6060	5'-3 3/16"	1'-6"	14
	90	6RT6090	7'-10 7/8"	1'-6"	20
	180	6RT60180	15'-9 11/16"	1'-0"	40
72"	90	6RT7290	9'-5 11/16"	1'-6"	24
	180	6RT72180	18'-11 3/8"	1'-0"	48

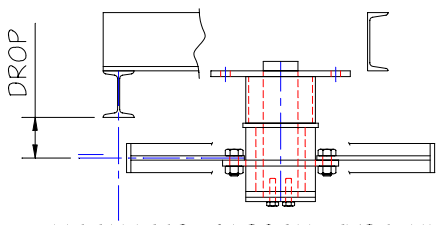
Traction Wheel Turn Assembly



DODGE TYPE HUB



TAPERED ROLLER BRG. TYPE HUB



METALIZED CARBON TYPE HUB

Traction Wheel Turns offer the most efficient means of maintaining chain and trolley alignment in horizontal turns. Because the chain rides the wheel around the turn there is less chain wear, chain pull and friction that allows for a longer chain life. In addition, maintenance costs are reduced, as only one point lubrication is required. The initial cost is somewhat higher than roller turns; traction wheel turns offer many long-term benefits.

Handling Systems traction wheel turns are made with a structural plate type construction with a heavy rolled steal rim. The plates are laser cut to ensure concentricity and are securely bolted to the bearing hub. A heavy structural steel frame and accurately rolled rail make up the complete unit. All traction wheel turns over 48” in diameter are either made with spokes or plate with lightening holes.

Traction wheel turns are available in standard designs with all the various diameters and degrees of radius as shown. Special radius and degree turns as well as a spread design can be fabricated upon request.

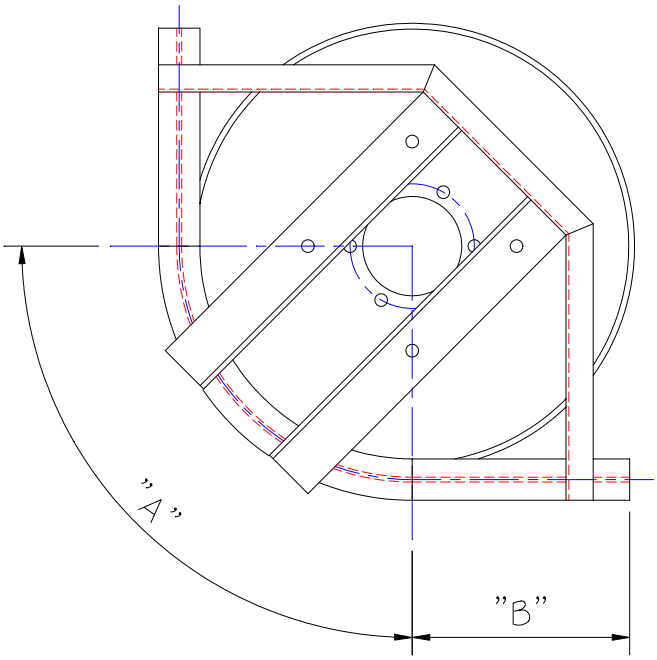
Handling Systems provides three types of traction wheel hubs; (D) Dodge tapered roller bearing type hub assembly (pre-assembled), (T) Timken tapered roller bearings in a machined hub and a (C) metalized carbon bushed hub.

When laying out or ordering a traction wheel turn it is important to remember that traction wheel turns are identified with diameter and not radius that is associated with horizontal roller turns. Simply specify the rail size, pitch diameter, degree of turn and the type of bearing desired. This can be done, for example, by taking the basic part number, which would be 3-TW3690-T for a 3” system with a 36” diameter wheel with 90 degrees of turn and adding a “T” for a Timken tapered roller bearing. On a 4” size, the drop desired should also be specified.

Traction Wheel Part No.'s & Dimensions

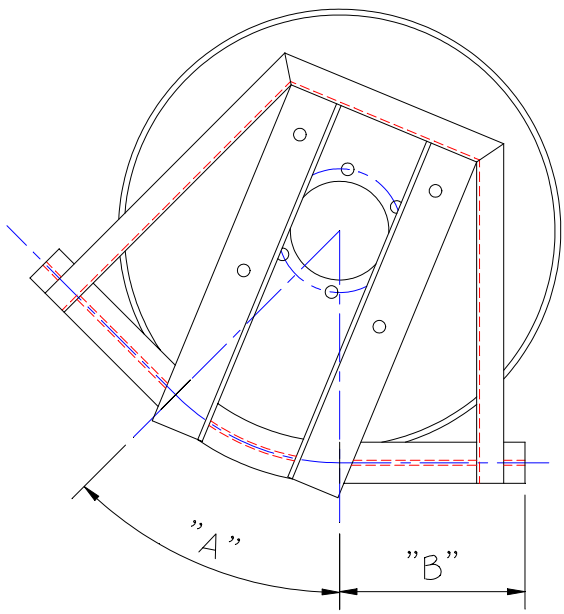
P.D.	Deg.	Basic Part. No.	3" Drop = 2 1/2"		4" Drop = 3 3/16"or 4"		6" Drop = 4"	
			A	B	A	B	A	B
24"	30	TW2430	6 1/8"	1'-0"	6 5/16"	1'-0"	-	-
	45	TW2445	9 1/4"	1'-0"	9 7/16"	1'-0"	-	-
	60	TW2460	1'-5/16"	1'-0"	1'-9/16"	1'-0"	-	-
	90	TW2490	1'-6 7/16"	2'-1/2"	1'-6 7/8"	2'-1/2"	-	-
	180	TW24180	3'-15/16"	1'-0"	3'-1 11/16"	1'-0"	-	-
30"	30	TW3030	0'-7 3/4"	1'-0"	7 7/8"	1'-0"	-	-
	45	TW3045	0'-11 9/16"	1'-0"	11 3/4"	1'-0"	-	-
	60	TW3060	1'-3 7/16"	1'-0"	1'-3 11/16	1'-0"	-	-
	90	TW3090	1'-11 3/16"	2'-3 1/2"	1'-11 9/16"	2'-3 1/2"	-	-
	180	TW30180	3'-10 3/8"	1'-0"	3'-11 1/8"	1'-0"	-	-
36"	30	TW3630	0'-9 5/16"	1'-0"	9 7/16"	1'-0"	9 7/16"	1'-4"
	45	TW3645	1'-1-15/16"	1'-0"	1'-2 1/8"	1'-0"	1'-2 1/8"	1'-5"
	60	TW3660	1'-6 5/8"	1'-0"	1'-6 7/8"	1'-0"	1'-6 7/8"	1'-6"
	90	TW3690	2'-3 7/8"	2'-6 1/2"	2'-4 1/4"	2'-6 1/2"	2'-4 1/4"	2'-11"
	180	TW36180	4'-7 3/4"	1'-0"	4'-8 9/16"	1'-0"	4'-8 9/16"	1'-3"
42"	30	TW4230	0'-10 7/8"	1'-0"	11"	1'-0"	11"	1'-4"
	45	TW4245	1'-4 5/16"	1'-0"	1'-4 1/2"	1'-0"	1'-4 1/2"	1'-5"
	60	TW4260	1'-9 3/4"	1'-0"	1'-10"	1'-0"	1'-10"	1'-6"
	90	TW4290	2'-8 5/8"	2'-9 1/2"	2'-9"	2'-9 1/2"	2'-9"	3'-2"
	180	TW42180	5'-5 3/16"	1'-0"	5'-6"	1'-0"	5'-6"	1'-1"
48"	30	TW4830	1'-7/16"	1'-0"	1'-9/16"	1'-0"	1'-9/16"	1'-4"
	45	TW4845	1'-6 5/8"	1'-0"	1'-6 7/8"	1'-0"	1'-6 7/8"	1'-5"
	60	TW4860	2'-7/8"	1'-0"	2'-1 1/8"	1'-0"	2'-1 1/8"	1'-6"
	90	TW4890	3'-1 5/16"	3'-1/2"	3'-1 11/16	3'-1/2"	3'-1 11/16"	3'-5"
	180	TW48180	6'-2 5/8"	1'-0"	6'-3 3/8"	1'-0"	6'-3 3/8"	1'-1"
54"	30	TW5430	1'-2"	1'-0"	1'-2 1/8"	1'-0"	1'-2 1/8"	1'-4"
	45	TW5445	1'-9"	1'-0"	1'-9 3/16"	1'-0"	1'-9 3/16"	1'-5"
	60	TW5460	2'-4"	1'-0"	2'-4 1/4"	1'-0"	2'-4 1/4"	1'-6"
	90	TW5490	3'-6"	3'-3 1/2"	3'-6 7/16"	3'-3 1/2"	3'-6 7/16"	3'-8"
	180	TW54180	7'-0"	1'-0"	7'-13/16"	1'-0"	7'-13/16"	1'-6"
60"	30	TW6030	1'-3 9/16"	1'-0"	1'-3 11/16"	1'-0"	1'-3 11/16"	1'-4"
	45	TW6045	1'-11 3/8"	1'-0"	1'-11 9/16"	1'-0"	1'-11 9/16"	1'-5"
	60	TW6060	2'-7 1/8"	1'-0"	2'-7 7/16"	1'-0"	2'-7 7/16"	1'-6"
	90	TW6090	3'-10 3/4"	3'-6 1/2"	3'-11 1/8"	3'-6 1/2"	3'-11 1/8"	3'-11"
	180	TW60180	7'-9 1/2"	1'-0"	7'-10 1/4"	1'-0"	7'-10 1/4"	1'-6"
72"	90	TW7290	4'-8 3/16"	4'-1/2"	4'-8 9/16"	4'-1/2"	4'-8 9/16"	4'-5"
	180	TW72180	9'-4 3/8"	1'-0"	9'-5 1/8"	1'-0"	9'-5 1/8"	1'-6"

Standard Traction Wheel Assemblies

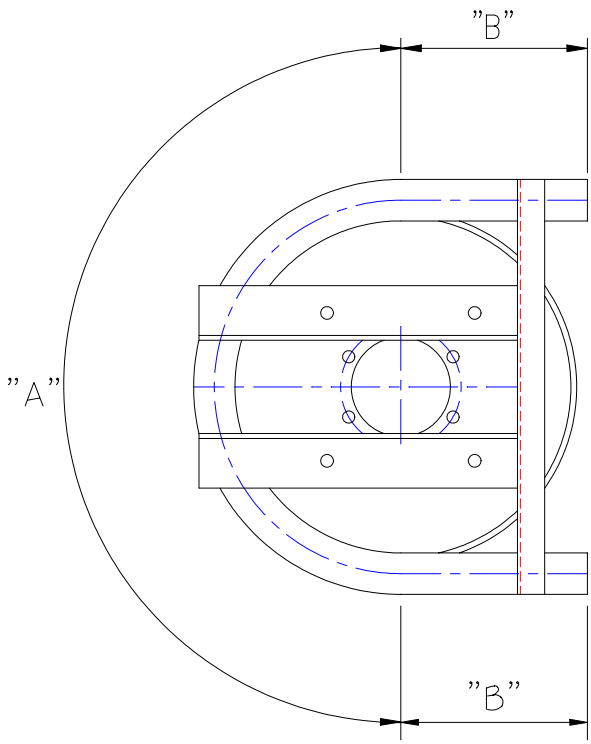


90 DEGREE

*Special Pitch Diameter (P.D.)
And Degree Turns can be Fabricated
Upon Request



30, 45 & 60 DEGREE



180 DEGREE

Overhead Conveyor Vertical Curves

Example:
Given: 10'-0" Radius x 45 Degree and
12'-0" Elevation Change

Step 1
Find: L(tan/tan) = 2C + E
Find: Total Rail Length (2A + G)

From Table No. 1 - 10'-0" Rad. X 45 Deg.

Step 2

"a"	"b"	"c"
7'-10 1/4"	2'-11 1/4"	7'-0 7/8"

Step 3
Drop (D) = 2b + F
F = D - 2b
F = 12'-0" - 2(2'-11 1/4") = 6'-1 1/2"

From Table No. 2: Find the Value of "E" and "G" with "F" = 6'-1 1/2"

Step 4

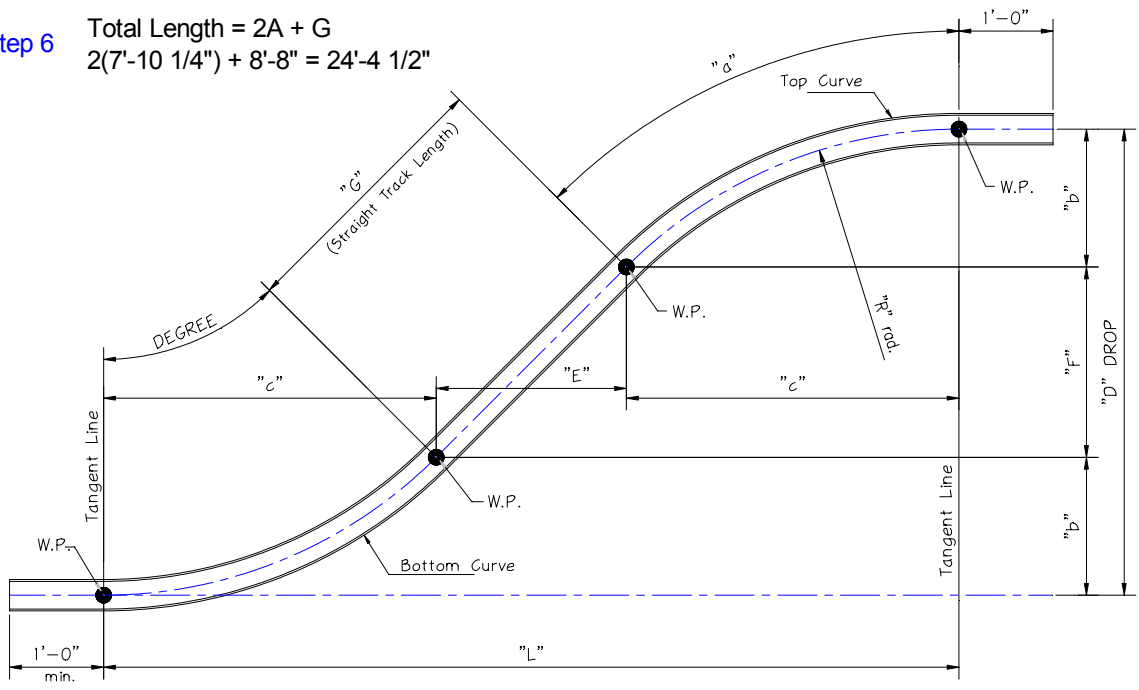
	"F"	"E"	"G"
	6'-0"	6'-0"	8'-5 13/16"
	1"	1"	1 7/16"
	1/2"	1/2"	3/4"
Totals	6'-1 1/2"	6'-1 1/2"	8'-8"

Step 5
L(tan/tan) = 2c + E
2(7'-0 7/8") + 6'-1 1/2" = 20'-3 1/4"

Step 6
Total Length = 2A + G
2(7'-10 1/4") + 8'-8" = 24'-4 1/2"

Dimensions of single vertical curves can Be obtained from Table No. 1, selected By the arc and radius.

The dimensions of compound vertical Curves can be obtained by working Table No. 1 and Table No. 2 according to the Arc and radius selected.



L=2C + E D=2b + F Total Length=2a + G

COMPOUND VERTICAL CURVE

Vertical Curve Tables

Single Vertical Curve Dimensions

		20 Degree			30 Degree			45 Degree		
		a	b	c	a	b	c	a	b	c
Standard Radius	3'-6"	1'-2 5/8"	2 5/8"	1'-2 1/2"	1'-0 1/4"	5 5/8"	1'-9"	2'-9"	1'-0 1/2"	2'-5 9/16"
	5'-0"	1'-8 15/16"	3 11/16"	1'-8 5/8"	2'-7 15/16"	8"	2'-6"	3'-11 1/8"	1'-5 5/8"	3'-6 7/16"
	6'-6"	2'-3 1/4"	4 11/16"	2'-2 11/16"	3'-4 13/16"	10 7/16"	3'-3"	5'-1 1/4"	1'-10 7/8"	4'-7 1/8"
	8'-0"	2'-9 1/2"	5 13/16"	2'-8 13/16"	4'-2 1/4"	1'-0 7/8"	4'-0"	6'-3 3/8"	2'-4 1/8"	5'-7 7/8"
	10'-0"	3'-5 7/8"	7 1/4"	3'-5 1/16"	5'-3 7/8"	1'-4 1/16"	5'-0"	7'-10 1/4"	2'-11 1/4"	7'-0 7/8"
	12'-0"	4'-2 1/4"	8 11/16"	4'-4 1/4"	6'-3 3/8"	1'-7 5/16"	6'-0"	9'-5 1/16"	3'-6 3/16"	8'-5 13/16"
	15'-0"	5'-2 13/16"	10 7/8"	5'-1 1/2"	7'-11 7/8"	2'-0 1/8"	7'-6"	11'-9 3/8"	4'-4 11/16"	10'-7 1/4"
	20'-0"	6'-11 3/4"	1'-2 1/2"	6'-10 1/16"	10'-7 13/16"	2'-8 3/16"	10'-0"	15'-8 1/2"	5'-10 1/4"	14'-1 11/16"

Table No. 1

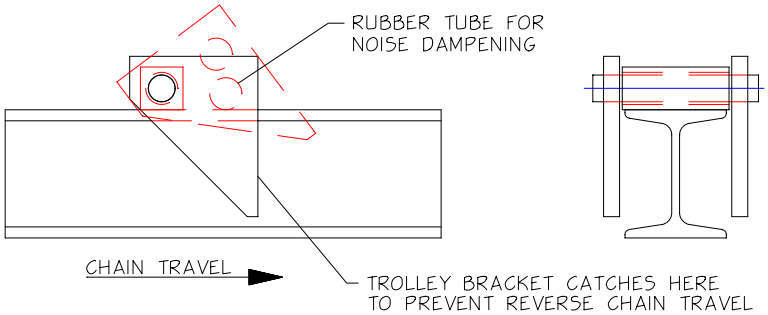
Compound Vertical Curve Dimensions

20 Degree			30 Degree			45 Degree		
F	E	G	F	E	G	F	E	G
1/8"	3/8"	3/8"	1/8"	1/4"	1/4"	1/8"	1/8"	3/16"
1/4"	11/16"	3/4"	1/4"	7/16"	1/2"	1/4"	1/4"	3/8"
3/8"	1-1/16"	1-1-1/8"	3/8"	11/16"	3/4"	3/8"	3/8"	9/16"
1/2"	1-3/8"	1-1/2"	1/2"	7/8"	1"	1/2"	1/2"	3/4"
5/8"	1-3/4"	1-13/16"	5/8"	1-1/8"	1-1/4"	5/8"	5/8"	15/16"
3/4"	2-1/16"	2-1/4"	3/4"	1-5/16"	1-1/2"	3/4"	3/4"	1-1/8"
7/8"	2-7/16"	2-9/16"	7/8"	1-1/2"	1-3/4"	7/8"	7/8"	1-5/16"
1"	2-3/4"	2-15/16"	1"	1-3/4"	2"	1"	1"	1-7/16"
2"	5-1/2"	5-7/8"	2"	3-7/16"	4"	2"	2"	2-13/16"
3"	8-1/4"	8-3/4"	3"	5-3/16"	6"	3"	3"	4-1/4"
4"	11"	11-11/16"	4"	6-15/16"	8"	4"	4"	5-11/16"
5"	1'-1-3/4"	1'-2-5/8"	5"	8-11/16"	10"	5"	5"	7-1/16"
6"	1'-4-1/2"	1'-5-9/16"	6"	10-3/8"	1'-0	6"	6"	8-1/2"
7"	1'-7-1/4"	1'-8-7/16"	7"	1'-0-1/8"	1'-2"	7"	7"	9-7/16"
8"	1'-10"	1'-11-3/8"	8"	1'-1-7/8"	1'-4"	8"	8"	11-5/16"
9"	2'-0-3/4"	2'-2-5/16"	9"	1'-3-9/16"	1'-6"	9"	9"	1'-0-11/16"
10"	2'-3-1/2"	2'-5-1/14"	10"	1'-5-5/16"	1'-8"	10"	10"	1'-2-1/8"
11"	2'-6-3/16"	2'-8-3/16"	11"	1'-7-1/16"	1'-10"	11"	11"	1'-3-9/19"
1'-0"	2'-8-15/16"	2'-11-1/16"	1'-0"	1'-8-3/4"	2'-0"	1'-0"	1'-0"	1'-5"
2'-0"	5'-5-15/16"	5'-10-3/16"	2'-0"	3'-5-9/16"	4'-0"	2'-0"	2'-0"	2'-9-15/16"
3'-0"	8'-2-7/8"	8'-11-1/4"	3'-0"	5'-2-5/16"	6'-0"	3'-0"	3'-0"	4'-2-15/16"
4'-0"	10'-11-7/8"	11'-8-3/8"	4'-0"	6'-11-1/8"	8'-0"	4'-0"	4'-0"	5'-7-7/8"
5'-0"	13'-8-13/16"	14'-7-7/16"	5'-0"	8'-7-7/8"	10'-0"	5'-0"	5'-0"	7'-0-13/16"
6'-0"	16'-5-3/4"	17'-6-1/2"	6'-0"	10'-4-11/16"	12'-0"	6'-0"	6'-0"	8'-5-13/16"
7'-0"	19'-2-3/4"	20'-5-5/8"	7'-0"	12'-1-7/16"	14'-0"	7'-0"	7'-0"	9'-10-3/4"
8'-0"	21'-11-11/16"	23'-4-11/16"	8'-0"	13'-10-3/16"	16'-0"	8'-0"	8'-0"	11'-3-3/4"
9'-0"	24'-8-11/16"	26'-3-13/16"	9'-0"	15'-7"	18'-0"	9'-0"	9'-0"	12'-8-3/4"
10'-0"	27'-5-5/8"	29'-2-7/8"	10'-0"	17'-3-13/16"	20'-0"	10'-0"	10'-0"	14'-1-11/16"

Table No. 2

Overhead Conveyor Vertical Curve Safety Devices

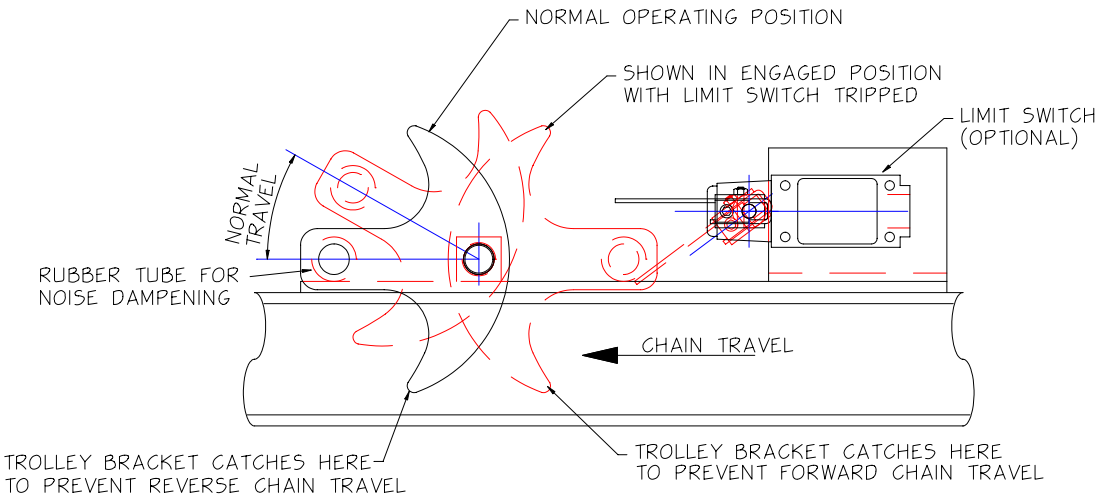
Safety devices preventing runaway or backup in the event of chain breakage are important, particularly where changes in elevation of 7 ft. or more are involved in the system.



The anti-backup prevents reverse conveyor travel on incline vertical curves:

ANTI-BACK UP DEVICE

Track Size	Part No.
3”	3-310
4”	4-410
6”	6-610

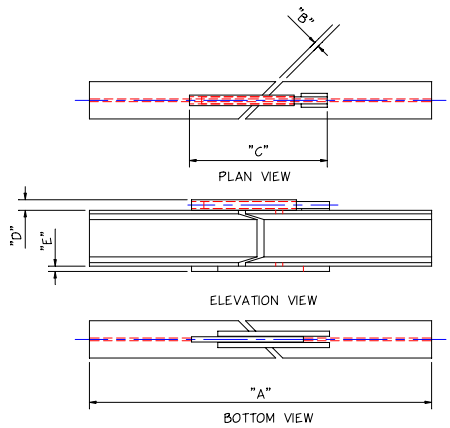


ANTI-RUNAWAY DEVICE

Track Size	Part No. w/o Limit Switch	Part No. w/ Limit Switch
3”	3-313	3-313-LS
4”	4-413	4-413-LS
6”	6-613	6-613-LS

The decline safety device prevents runaway if the chain should break or travel faster than normal on a decline vertical curve. Anti-runaway devices can be utilized with or without a limit switch. The limit switch is usually connected in with the emergency stop circuit of the controls and the anti-runaway will not only stop the chain but will also stop the drive motor.

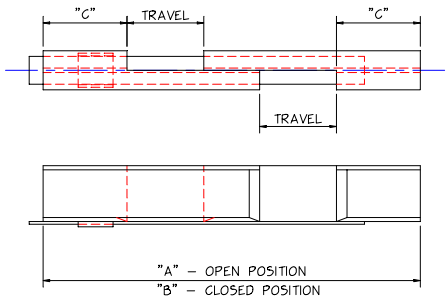
Overhead Conveyor
Track Expansion Joints



OVEN EXPANSION JOINT

Oven Expansion Joints must be used on any conveyor passing through an oven or other heat-treating process to compensate for the expansion caused by the processing heat. A normal expansion rate is ¾" per 100 ft. of track for each 100 degrees of temperature rise. There are two types of as shown: Standard Take-up Expansion Joints and Oven Expansion Joints.

OVEN EXPANSION JOINT							
I-Beam Size	Travel	Part No.	A	B	C	D	E
3"	3/8"	3-133	2'-0"	1/4"	10"	1 1/16"	1/4"
4"	1/2"	4-133	2'-0"	3/8"	10"	1 1/16"	3/8"
6"	1/2"	6-133	2'-0"	3/8"	10"	1 1/8"	3/8"

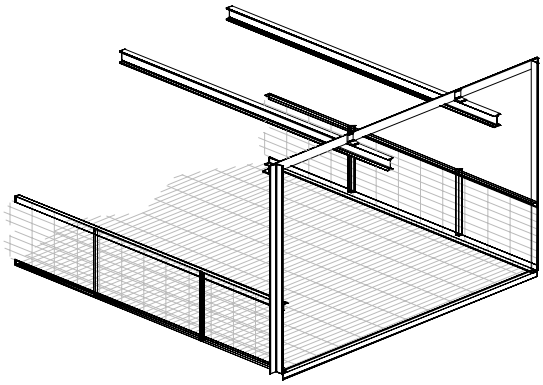


TAKE–UP EXPANSION JOINT

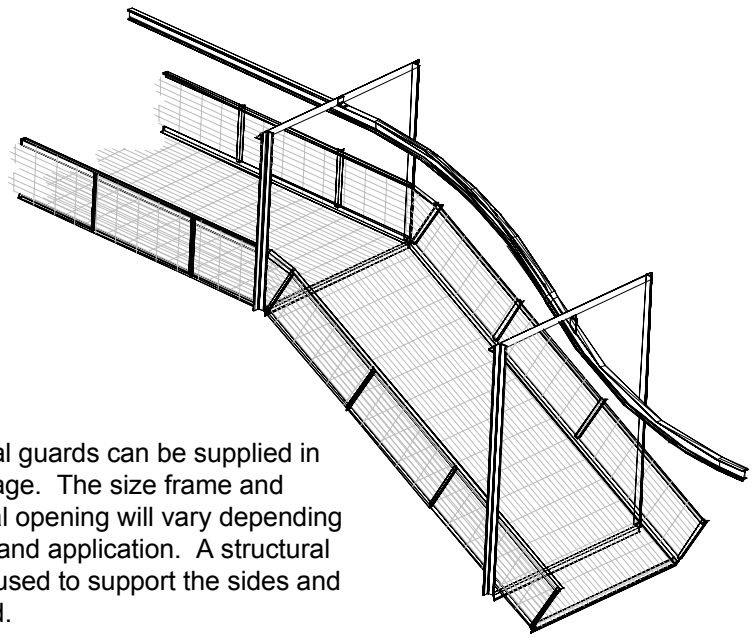
In planning a new or revised system another important consideration is the need for expansion joints to compensate for chain slack, elongation caused by wear or temperature changes, and to keep the chain tight. Take up expansion joints available for this purpose becomes an expandable link in the conveyor track.

TAKE-UP EXPANSION JOINT					
I-Beam Size	Travel	Part No.	A	B	C
3"	8"	3-161-A	2'-5 1/2"	1'-9 1/2"	6"
	12"	3-161-B	2'-11 1/2"	1'-11 1/2"	6"
	16"	3-161-C	4'-3 1/2"	2'-11 1/2"	9"
	24"	3-161-D	7'-0 1/2"	5'-0 1/2"	1'-5 1/2"
4"	8"	4-161-A	2'-5 1/2"	1'-9 1/2"	6"
	12"	4-161-B	2'-11 1/2"	1'-11 1/2"	6"
	16"	4-161-C	4'-3 1/2"	2'-11 1/2"	9"
	24"	4-161-D	7'-0 1/2"	5'-0 1/2"	1'-5 1/2"
6"	8"	6-161-A	2'-5 1/2"	1'-9 1/2"	6"
	12"	6-161-B	2'-11 1/2"	1'-11 1/2"	6"
	16"	6-161-C	4'-3 1/2"	2'-11 1/2"	9"
	24"	6-161-D	7'-0 1/2"	5'-0 1/2"	1'-5 1/2"

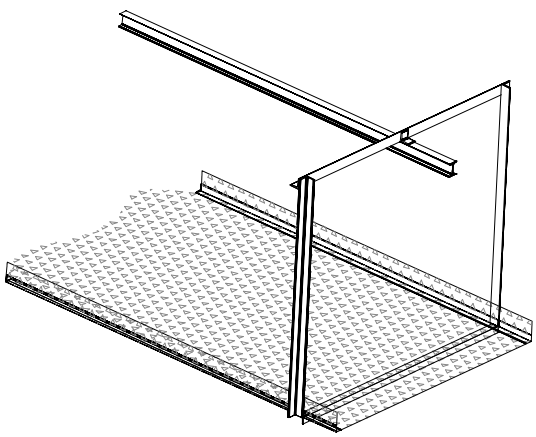
Overhead Conveyor Guarding



Wire mesh type conveyor guards are generally a more expensive product guard but are less expensive to erect. Wire mesh guards are typically a 2” x 4” grid made from #2 gage wire and all intersections are welded. Each section or panel is connected together with spirally wound wire for easy assembly. Different sizes in length and width are available in 1’-0” increments. The guard is normally supported on 8’-0” centers but may vary depending on load conditions.

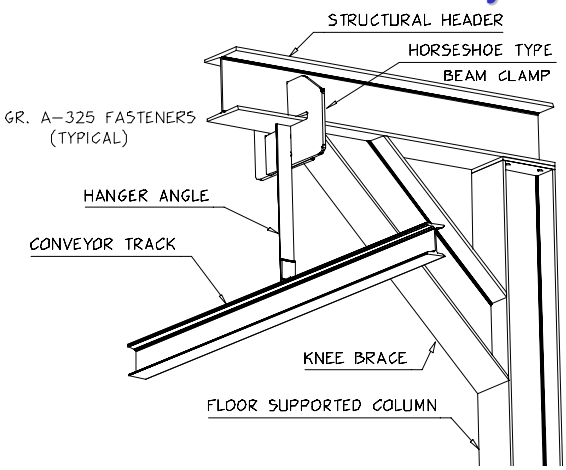


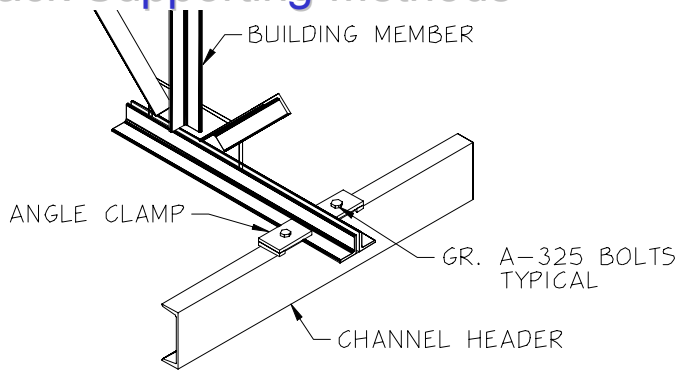
Expanded metal guards can be supplied in any size and gage. The size frame and expended metal opening will vary depending on the product and application. A structural angle frame is used to support the sides and top of the guard.

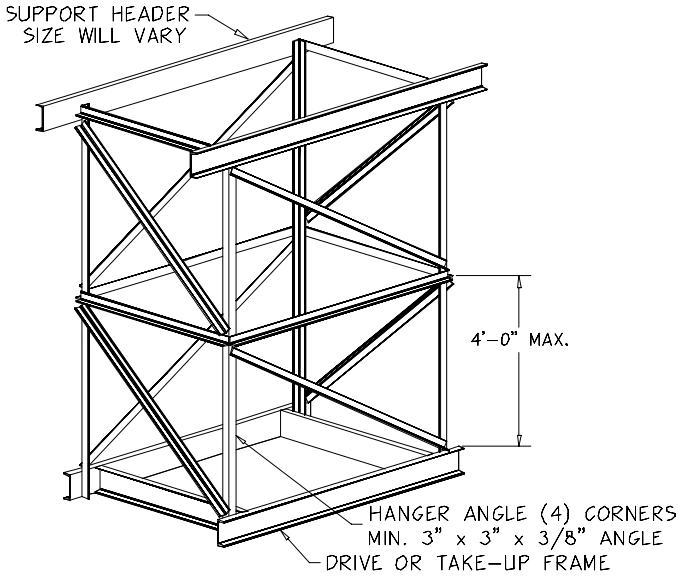


Sheet metal type guards are typically furnished after dip tanks and/or washers. The liquid that may drip off of the product is captured and returned back into the tank or washer. The support hangers for a sheet metal guard will vary depending on the loading and application.

Overhead Conveyor Track Supporting Methods

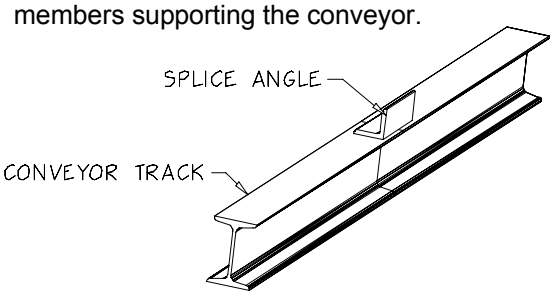


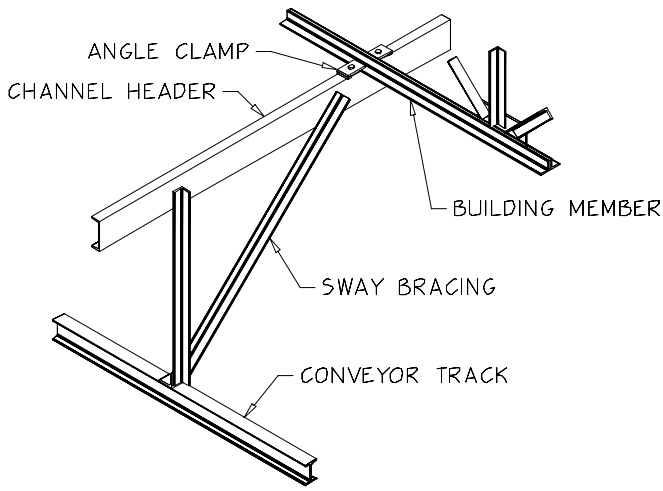




Installations of Overhead Conveyor systems will often vary depending on several parameters. Light loads that can be supported from the building or heavier loads with larger chain pull may require a floor-supported system with structural columns and support members. The methods shown are suggested to illustrate how a conveyor system may be suspended.

Header members and hanger assemblies can be either a bolted or a welded connection. Conveyor support members should never be welded to building steel. A clamp of sufficient capacity should be used to connect support members to the building steel. The design of support steel, either building or floor supported, has been standardized for most conditions by the industry. It is important to remember that the load carrying capacity of the conveyor system is only as strong as the members supporting the conveyor.





When erecting a conveyor system, it is important the track be aligned in both the horizontal and vertical planes. The track should be as straight as possible in order to reduce unnecessary friction caused by the trolley wheels rubbing against the web of the I-beam. Diagonal and sway bracing is important to reduce any unwanted movement in the conveyor system while in operation. Bracing will also maintain the conveyor system accuracy, especially in the areas of robotic or automatic painting; in addition inadequate bracing could induce a surge in the chain.

Maintenance Instructions

To maintain your Conveyor System in good operating condition, proper lubrication and periodic inspection of all machinery and conveyor components is essential.

A constant check must be kept on the entire system for broken, bent or missing parts. The system will not run properly with missing or defective components.

The following are recommended maintenance procedures that if followed systematically, in addition to periodic inspections, will greatly contribute to the efficiency and operational life of the system.

Warning: Make no adjustments on the conveyor while it is in operation.

BEFORE MAINTENANCE

- ✓Since maintenance functions are generally to be preformed while the conveyor is off, the main power switch to the conveyor should be locked in the open or off position. This will prevent anyone inadvertently applying power to the system while maintenance personnel are working on the system.
- ✓Do not perform any work on the system while it is running unless the nature of the maintenance absolutely requires operation of the system. When the system must be operated to perform maintenance procedures, allow only experienced maintenance personnel, who have been instructed on the operation of the conveyors, to do the work.

DURING MAINTENANCE

- ✓Do not wear loose clothing while performing maintenance on operating equipment.
- ✓Be alert to hazardous conditions, such as sharp edges and protruding parts.
- ✓When using mechanical aids, hoist, cables, and other equipment to perform maintenance, use with extreme care. The use of such aids could cause damage to the conveyors that in turn could cause a dangerous condition when the conveyor is turned back on.
- ✓Poor housekeeping practices can lead to accidents and inefficient conveyor operation. Clean up spilled lubricants and other material as completely and promptly as possible, especially material caught or lodged in the moveable parts but only when the conveyor is off.

AFTER MAINTENANCE

- ✓Do a “walk around” of the conveyor and make certain all safety devices and guards are in place and all tools or maintenance equipment have been removed from the conveyor area.
- ✓Make certain all personnel are clear of the conveyor and are made aware that the conveyor is about to be started.
- ✓Only authorized personnel should be permitted to start the conveyor following maintenance or any emergency shut-off.

Maintenance & Trouble Shooting

CHAIN

Trouble	Probable Cause	Remedy
1 Excessive Chain Wear.	A. Lack Of Lubrication.	Lubricate Chain -or- Check Automatic Lubricator. A. Note: The Chain Will Grow And Wear Where The Chain Pin Contacts The Chain Link -- This Is Normal Wear And Is No Fault Of The System.
	B. Sluggish Or Frozen Trolleys.	B. See #1 Under "Trolleys".
	C. Roller Turn Roller Is Seized Up.	C. See #1 Under " Roller Turns".
	D. Obstruction In Chain Path.	D. Remove Obstruction And Replace Damaged Chain.
	E. Conveyor Overloaded.	E. Remove Additional Loading To Bring Conveyor Back To Its Original Load Capacity.
	F. Pressure To High On Takeup Unit.	F. Reduce Pressure To Around (5-15 PSI), Never Exceed 30 PSI.
2 Excessive Slack Chain	A. Chain Growth Through Normal Wear.	A. Remove Excess Slack In Chain In Low Chain Pull Areas (I.E., Take-up Area, After Vertical Drops.)
	B. Incorrect Air Pressure	B: Adjust Pressure To Around (5-15 PSI), Never Exceed 30 PSI.

TROLLEY WHEELS

Trouble	Probable Cause	Remedy
1 Sluggish Or Frozen Wheels.	A. Residue Accumulated From Over-Lubrication.	A. Remove Welsh Plug (If Installed). Clean With A Degreaser And Replace Welsh Plug.
	B. Bearings Are Corroded Or Worn Out.	B. Replace Wheels.
2 Bent Trolley	A. Damaged In Jam Or By An Obstruction In The Chain Path.	A. Remove Trolley Brackets And Replace Damaged Trolley Bracket With A New Bracket. (Do Not Attempt To Straighten Bent Brackets.

Maintenance & Trouble Shooting

ROLLER TURN

Trouble	Probable Cause	Remedy
1 Sluggish Or Frozen Roller Turn.	A. Dirt Or Grease Residue.	A. Clean With A Degreaser And Replace If Bearings Are Damaged.

I-BEAM TRACK

Trouble	Probable Cause	Remedy
1 Excessive Wear Or Peening Of Flanges At Vertical Curves.	A. Excessive Chain Tension.	A. See #1 Under "Chain".
2 Excessive Wear On I-Beam Web	A. Bent Trolley Bracket.	A. Locate Bent Trolley Bracket And Replace With A New Bracket. (Do Not Attempt To Straighten Bent Brackets).

TAKE-UP

Trouble	Probable Cause	Remedy
1 Floating Frame Movement Sluggish Or Frozen.	A. Air pressure to low.	A. Increase air pressure on regulator. Regulator will be located on the regulator board mounted at the back of the take-up.
	B. Dry Or Damaged Take-up Sleeve.	B. Lubricate If Dry Or Replace Takeup Sleeve If Damaged.
	C. Excessive Chain Tension.	C. See #1 Under " Chain".
	D. Guide Wheels Worn Or Frozen With Dirt And Grease Residue.	D. Clean Thoroughly Or Replace If Worn.

CAT. DRIVE

Trouble	Probable Cause	Remedy
1 Decrease In Conveyor Speed.	A. Drive Belt Slippage.	A. Adjust Belt By Loosening Bolts On Motor And Pull Back Until Belt Is Snug.
	B. Set Screws On Pulley Are Loose And Causing Pulley To Rotate On Shaft.	B. Align Pulley And Tighten Set Screws.
	C. Conveyor Chain Tension Is Excessive.	C. Conveyor Should Trip Out Before Speed Decreases. Check For Limit Switch Failure And See #1 Under "Chain".

Maintenance & Trouble Shooting

Trouble	Probable Cause	Remedy
2 Excessive Noise In Reducer.	A. Lack Of Lubrication.	A. Fill Reducer With Oil-To-Oil Level: Change Oil If Necessary. Grease All Fittings.
	B: Oil Leak.	B. Tighten All Grease Fittings And Pipe Plugs And Add Lubricant.
	C. Worn Or Broken Gear.	C. Disassemble Reducer And Replace Damaged Gear.
3 Motor Running Above Normal Temperature.	A. Conveyor Chain Tension Excessive.	A. See #1 Under "Chain".
	B. Electrical.	B. Inspect Electrical Wiring And Controls.
4 Slapping Or Pulsating Caterpillar Chain.	A. Chain Too Loose.	A. Adjust Drive Takeup Unit Until Chain Is Snug. Do Not Remove Any Links Of Caterpillar Chain Or Dogs.
5 Floating Frames Sluggish Or Frozen.	A. Obstruction.	A. Remove Obstruction And Repair Or Replace Any Damaged Equipment.
	B. Guide Wheels Worn Or Frozen With Dirt Or Grease Residue.	B. Clean Thoroughly Or Replace If Worn Too Badly.

CAT. DRIVE (CONT'D)

Problem	Probable Cause	Recommendation
*Overheating	Loads exceeds reducer capacity.	Decrease load. Check catalog rating of the drive. Redesign drive and replace unit with one of sufficient capacity.
	Insufficient oil level.	Check the oil level. Adjust oil level as indicated by the Speed Reducers Sheet or as specified on the reducer nameplate.
	Too much oil. Excessive heat generated by the fluid friction of the churning action of the oil.	Check the oil level. Adjust oil level as indicated by the Speed Reducers Sheet or as specified on the reducer nameplate.
	Wrong grade of oil.	Flush reducer and refill as indicated by the Speed Reducers Instruction Sheet or as specified on reducer nameplate.

GEAR REDUCER

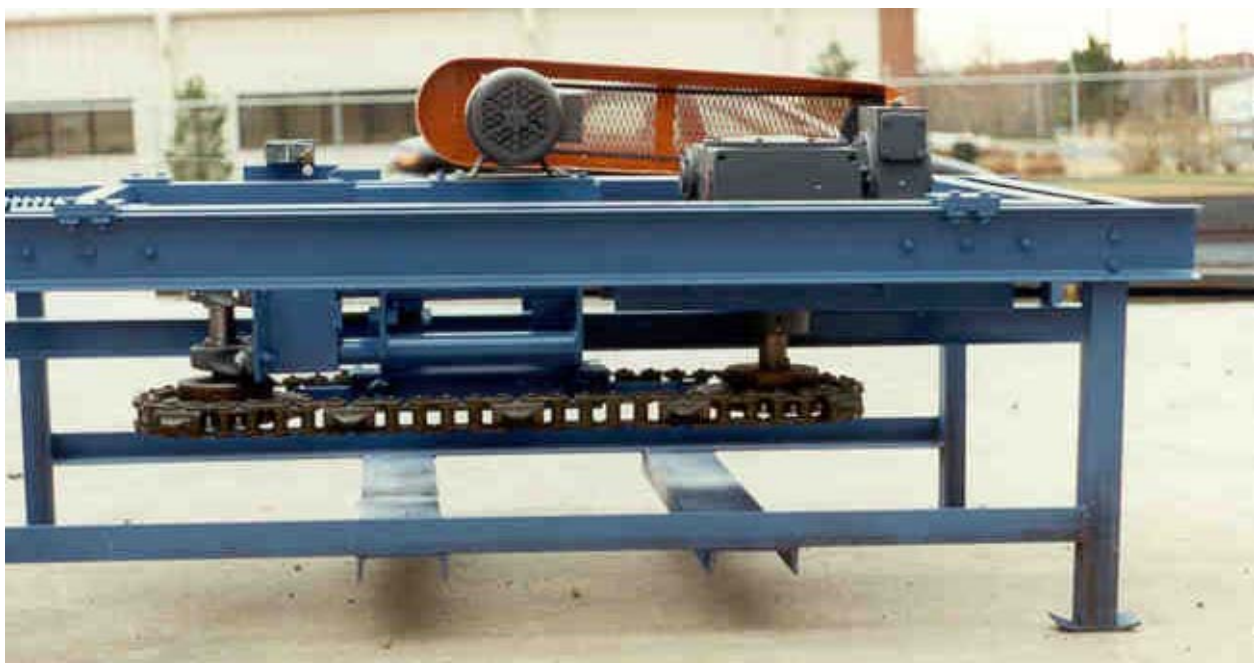
Maintenance & Trouble Shooting

*200 Degrees F. and above case temperature.	Excessive input speed.	Consult HSC relating all particulars including mounting position. ratio reducer.
Excessive noise vibration.	Worn bearings.	Check bearing for wear and replace worn bearings. Replace all seals. Flush reducer and refill with oil. Check thrust loads and overhung loads. If excessive, correct these conditions or replace with a larger unit.
	Drive under-designed causing premature excessive gear wear.	Redesign drive and replace with a drive of sufficient capacity.
	Insufficient oil level	Check oil level. Adjust oil level as indicated by the Speed Reducers Instruction Sheet or as specified on reducer nameplate.
	Improper connection with other machinery.	Inspect drive for loose bolts, nuts and screws and tighten where needed.
Excessive shaft end play.	Worn bearing.	Check bearings for wear and replace worn bearings. Replace all seals. Flush reducer and refill with oil.
	Loose end cover bolts.	Check and cover cap screws and tighten where necessary.
Excessive backlash	Worn Gears	Replace worn gears. Always replace mating gear.
	Worn keys.	Replace worn keys. Inspect keyways for wear. An oversize key may be required.
	Loose Bearings.	Check bearings for wear and replace worn bearings. Always replace seals. Check end covers for loose bolts.
	Excessive backlash in driven machinery.	Check driven machinery.
Oil leakage.	Oil level too high.	Check oil level. Adjust oil level as indicated by the Speed Reducers Instruction Sheet or as specified nameplate.
	Clogged breather plug.	Remove and clean breather plug.
	Seal damaged.	Replace seals.
	Loose bolts.	Tighten bolts.
	Breather plug in the wrong hole.	Relocate breather plug to the proper hole.

Maintenance & Trouble Shooting

Shafts will not turn when is actuated.	Backstop installed for reverse shaft rotation.	Remove backstop, turn end for end and reinstall.
	Driven machinery binding or locked up.	Check for free operation of driven machinery.
Backstops wear out prematurely.	Backstop overload.	Reduce load or replace with a larger drive.
Premature upper bearing failure (reducer mounted vertical position)	Standard reducer mounted in vertical position.	Replace unit with a vertical unit.
	Failure to lubricate upper grease fittings.	Make sure fittings are installed in upper cover.
Premature input bearing failure.	Excessive overhung load.	Check minimum sheave diameter and replace with a larger sheave. Check to insure that sheave is mounted as close to housing as possible. Check to insure that belt(s) are not over-tensioned.

GEAR REDUCER (CONT'D.)



General Conveyor Safety Requirements

Additional safety precautions may be found and are described under the "Operator Safety Instructions" of the HSC Maintenance Manual.

Note: Please make everyone that is in or around the conveyor area, or comes in contact with the conveyor, aware of the following items:

1. Should the conveyor stop and be restarted, you should hear a conveyor start-up warning horn and after a short delay, the conveyor will start moving. If this horn is not activated, immediately notify your superintendent, maintenance and/or engineering personnel to ascertain why the horn is not working, since the warning horn is an important part of the original system design.

2. **Do Not** position any part of your body in or around the conveyor, as it contains moving parts. **Do Not** try to dislodge any foreign debris, jams, carriers, etc. without shutting off power and performing necessary safety lockouts to the system.

3. **Do Not** perform any production or operator functions directly in the path of the conveyor.

4. The conveyor design incorporates safety items to minimize injury and downtime. Should you observe any unsafe condition, stop the conveyor and notify maintenance at once for proper repair. **Do Not** assume that the conveyor is incapable of having a problem, and **Do Not** position yourself in the conveyor path.

5. The conveyor chain must have a proper chain pretension, to provide a safe and operable system. This requires routine inspection and adjustment of the conveyor chain take-ups as well as removing slack chain to effect the proper chain tension.

6. Equipment should be inspected a minimum of once a month to assure that all components are in a safe and operable condition. The equipment must also receive proper lubrication to function properly, particularly when exposed to a washer, oven paint booth, etc. These contaminates can prevent the equipment from receiving and maintaining proper lubrication to critical points for free movement.

7. Utilizing non-HSC parts or performing system modifications using forces other than HSC, can void warranties and create unsafe operating conditions.

Operator Safety Instructions

These instructions have been prepared for the protection of operator and equipment. The degree of safety largely depends on control of the systems as a whole. Housekeeping is the first law of accident prevention.
Clear work areas and pathways of debris and obstructions. Do not operate conveyors unless authorized. Leave repair functions to trained maintenance personnel. Do not make speed changes, unless authorized. One who understands what effect these changes might have on the system should make speed variations. Do not remove machinery guards, even if you consider it convenient to work. When you depart from your equipment for more than a few minutes, the equipment should be shut down. Never lean heavily against any guardrail. Make a firm self-rule not to ride or step on conveyors. If a conveyor is being serviced and is shut down, watch that you are not working too close in case of start-up. Avoid leaning back into another moving conveyor or a slow moving load. In loading or unloading a conveyor consider clearances, visibility and protruding hazards. Watch loading of conveyors. Be sure the hookup is secure. If materials are piled on the conveyors, see that they aren't top heavy.

Do not attempt to load material that is too heavy or cumbersome for one man. Always ask for help. Should a load start to fall, let it fall clear, rather than risk serious injury. Start/Stop stations are clearly marked and located for easy accessibility n clear view of the conveyor. Do not hesitate to use, if necessary. Do not resort to horseplay, scuffling, or other such actions. Report any unsafe conditions beyond you control to the supervisor. In case of injury, take immediate action to obtain aid by competent personnel. If you see something that is potentially dangerous, report it to your supervisor immediately. Wear sturdy, heavy soled shoes. Shoes with badly worn soles should not be worn.

The procedures contained in this manual should be followed to minimize injury to personnel during maintenance and operation of the equipment. It is essential that your personnel involved in the maintenance and operation of equipment fully understand the importance of these instructions, which must be adhered to by you.

Besides the following safety procedures, you will find other safety and caution notes throughout this manual on maintenance and operation of equipment.

When any maintenance, repair or cleanup is performed for any reason on the equipment, the main external disconnect switch must be turned off and secured with a padlock with the key retained by maintenance personnel.

If the power need to remain on for testing electrical components, or mechanical functions, be sure a competent electrician is at hand to perform these test and that all operators or personnel involved with the equipment are aware of the testing and work being done.

Instruct all operators of the equipment in the safety procedures that must be followed along with the mechanical and electrical functions that are explained in this manual. Do not wear loose clothing while performing maintenance or operating equipment. When performing maintenance, use mechanical aids, hoists, cables and other equipment with extreme care.

Do not service pneumatic or hydraulic components until supply pressure is turned off and pressure is relieved from all lines and components.

Rotating shafts and above ground electrical potential of equipment can be hazardous. Therefore, it is strongly recommended that all electrical work conform to the National Electrical Coded and Local regulations. Qualified personnel should perform installation, alignment and maintenance.

Operator Safety Instructions (Cont'd.)

Only recommended test procedures, included in the instructions manual, should be followed. Electrical power should always be disconnected before working inside control enclosures.

Rotating shafts and couplings are protected with metal guards to provide protection against flying parts such as keys, bolts and coupling parts.
Even when a shaft is motionless it should be considered "alive" as long as its motor or prime mover is running. Keep hands away from the shaft until the motor and prime mover have completely stopped and the power is disconnected from the controller.

Provide immediate corrective measures if abnormal noises are detected. If noise is due to excessive vibration, chance for misalignment, buildup of foreign material, internal rotating components or bearing failure. Keep clear of the air discharge vents of air cooled machines. The air temperature may be elevated and particles may be propelled through the air stream by internal rotating components.

Before starting a piece of equipment that has been shut down for any purpose, insure that all personnel are clear and that everyone within the area is aware that the machine is about to be started.

Do not restart the equipment unless all safety devices are working and all guards are in place.

Be sure all tools and maintenance equipment are removed from the immediate area.

On all equipment that has safety interlocks, periodic inspection and functionally testing (daily) of all safety interlocks is required to assure proper operation.

Read this manual for further safety precautions and safety checks on components that exist in your system.

Emergency Procedures

(All Personnel)

Determine if the conveyor needs to be stopped and if it needs to be, stop it.

1. Go to the nearest Control Panel or Emergency Stop Push-Button Station.

2. Push the Emergency Stop Push-Button.

3. Stay at the Control Panel or Stop Station until the supervisor or knowledgeable person determines the reason for the stopping the conveyor.

4. Correct the cause of the emergency.

5. Restart the conveyor only after cause of emergency situation has been corrected and a safe condition prevails.

(Supervisors)

1. Go to the control panel.

2. Make sure conveyor cannot be restarted until problem is corrected.

3. Determine the reason the conveyor systems were stopped.

    a. If an emergency does not exist, restart the conveyor system.
    b. If an emergency does exist, take the necessary corrective action to correct the problem.
    c. Log in a written report of the emergency stoppage.

4. Restart the conveyor only when the cause of emergency has been corrected and a safe condition prevails.