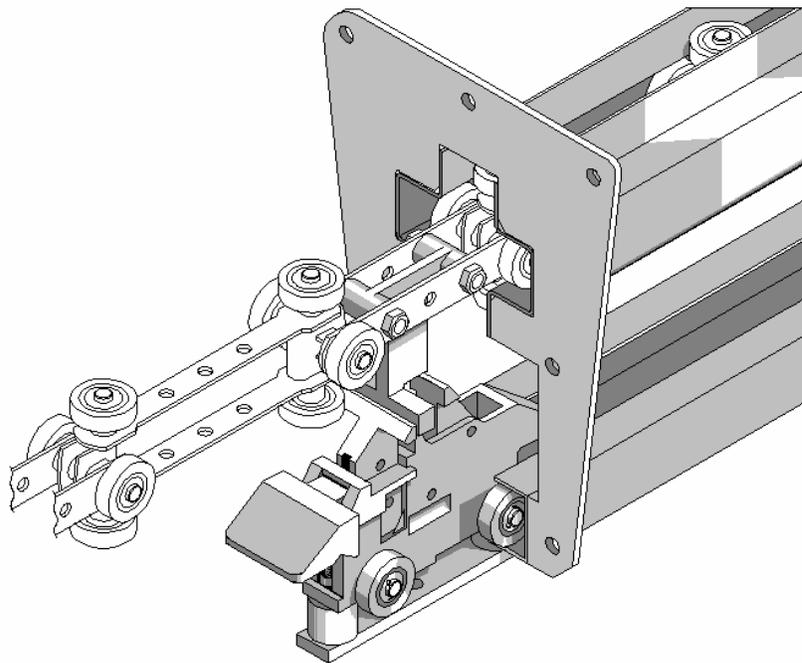


AT100 POWER & FREE CONVEYOR

COMPONENT SPECIFICATION



POWER & FREE INTRODUCTION

The success of a *Power & Free* conveyor system lies in its flexibility of operation, allowing the flow of product to be controlled with the correct sequencing taking place to suit a customer's individual and specific requirements and working environment.

Unlike conventional continuous running chain conveyors, where product loads are attached directly to the conveyor chain via jigs/attachments etc. a *Power & Free* system utilises a series of free running trolley assemblies, which may be connected together with the use of a flightbar, to carry the load.

This obviously eliminates any restrictions in the routing and online assembly operations, which would be apparent within the constraints of a typical chain conveyor layout.

The trolley assemblies are routed in a twin channel section and driven around the system dependant upon the application by a single or multiple conveyor chains, which are mounted above the twin track/trolley track section.

By utilising a trolley assembly to carry a product load, total flexibility, due to the unrestricted movement of the trolley assembly throughout the system can be achieved.

Trolley assemblies may be routed from one conveyor line to another by the use of special transfer devices, stopped on-line for assembly operations or accumulated within buffer zones.

Power & Free – System Features

- Flexibility of Product Routing* - This may be achieved from one assembly area to another automatically with the use of simple mechanical flags or electronic bar code scanners.
- Products can be routed from assembly load/off-load areas through process plant lines.
- Product Sortation* - Specific product types can be identified and automatically routed to specific destinations, buffer storage areas or assembly operations.
- Storage of Products* - Products can be stopped at virtually any position within a system, allowing various production processes or other functions to be carried out with the product stationary.
- Products can be stored within a buffer area allowing for operational and production imbalances, shift changes and staged start up/shutdown procedures.
 - High level buffer areas can be designated to store specific products, thus leaving valuable floor space available for other purposes.
- Raising/Lowering Products* - Products can be raised and lowered in a vertical plane with the use of a powered 'drop section' which can be utilised at load/off-load areas for larger product types. Variances in conveyor heights can also be accommodated with the use of a drop section where space is a premium, instead of a conventional rise/fall track section.

Conveyor Speeds

- A variance in assembly operations for different component types can be achieved with the transfer of products to separate conveyor lines. Varying product pitches relative to conveyor speeds and product sizes can often reduce the size of process plant items and running costs.

System Diagnostics

- By utilising a comprehensive PLC controlled diagnostics package, maintenance tasks can be eased with on-line technical information regarding running times and suggested maintenance frequencies. Product tracking can be achieved through various stages of manufacture with this facility.

AUTOTRACK 100 COMPONENT SPECIFICATION

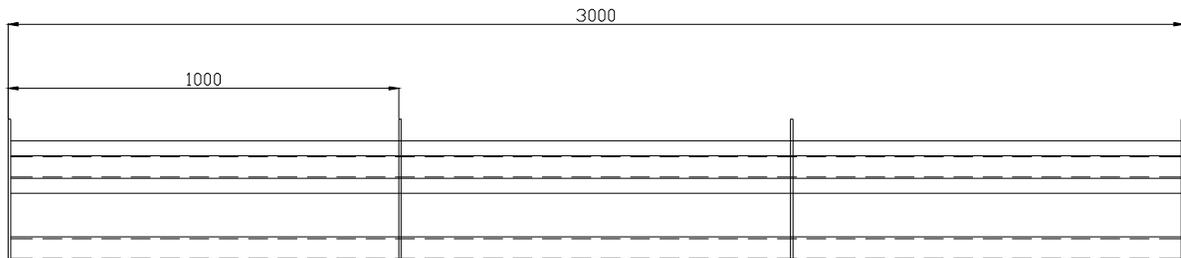
Straight Track Section

POWER & FREE

The straight track section is made up from two sets of accurately cold rolled steel sections mounted one above the other.

A pair of 'Top Hat' sections, which are placed on their sides are utilised as a carrying and guide medium for the conveyor chain, with a rolled channel section being used to support the trolley and loadbar assemblies. The two sections are then spaced apart by flange plates nominally pitched at 1000mm.

The design of the track section, once welded into an assembly, gives exceptional strength and a robust construction in the form of a composite beam, therefore minimizing support structure requirements.



AUTOTRACK 100 POWER & FREE STRAIGHT TRACK

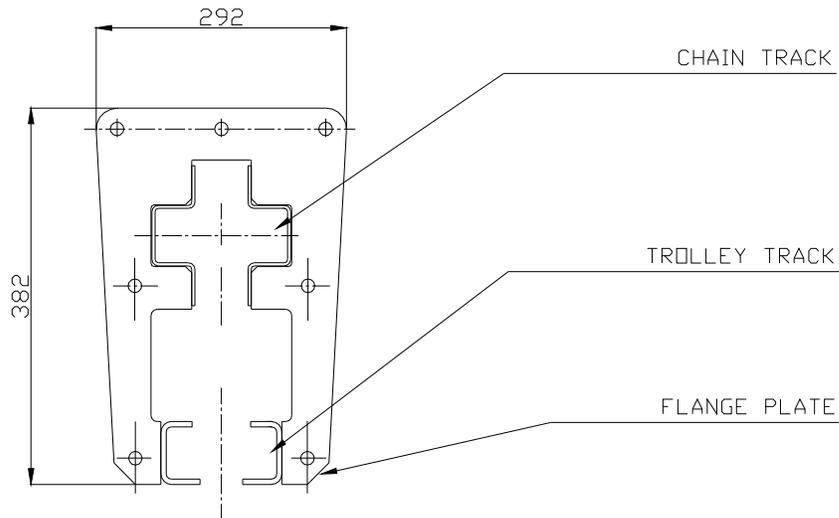
By utilising a channel section for the trolley track, the trolley and loadbar assemblies are totally captivated, thus eliminating any possibility of trolley 'jumping' within the track section when negotiating horizontal and vertical bends.

To ensure uniformity of quality all the track components are jig aligned and welded into standard 3000mm long sections, with variable lengths being cut and jig welded as required for make-up lengths within a conveyor circuit.

Straight Track cont'd

Each flange plate has 7 off holes which are used to bolt together each track joint, using 12mm fixings.

All internal running surfaces, on both the chain and trolley tracks, are aligned to ensure smooth running prior to final tightening of each joint, by our installation engineers.



Material Specification

Conveyor Track (chain) - Mild Steel HR15 Pickled and Oiled – 3 mm thick.
Conveyor Track (trolley) - Mild Steel HR15 Pickled and Oiled – 5 mm thick.
Track Flange Plate - Mild Steel - 6 mm thick.

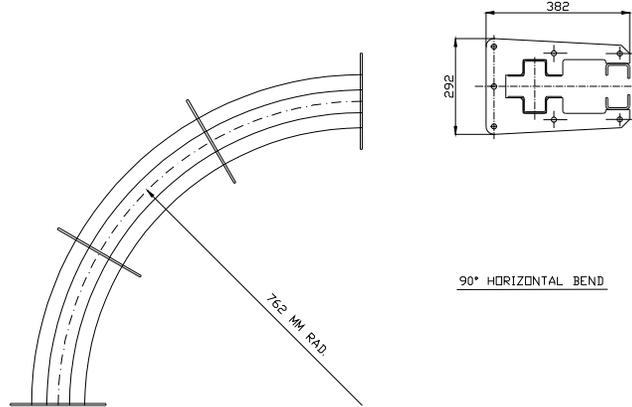
Finish

All conveyor track sections will be powder coated as standard.

Horizontal & Vertical Bends

POWER & FREE

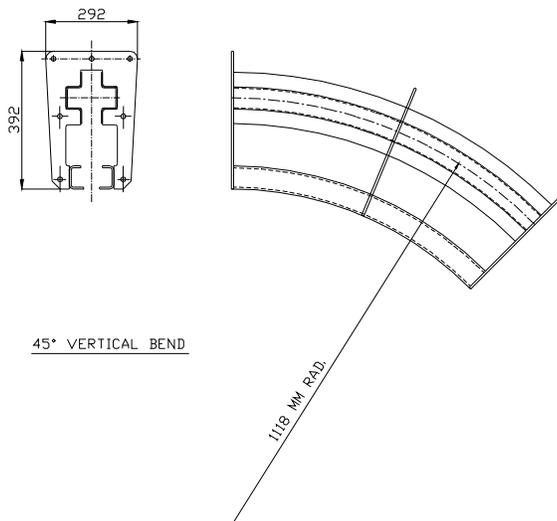
The configuration of the conveyor bends will be identical to that of the straight track, with the top hat and channel sections being rolled to the required radii and coupled with standard flange plates to be jig aligned and welded into a bend assembly.



Standard bend radii and angles are available, however non standard units or composite type bends can be supplied if required.

Standard Radii	-	Horizontal	762mm
	-	Vertical	1118mm
Standard Angles	-		15°, 30°, 45°, 60° and 90°

N.B. - When a change in direction of the conveyor routing is required, from horizontal to vertical planes, it is essential that a minimum length of 300mm of straight track be incorporated between horizontal and vertical bends.



Any bends positioned within a conveyor system layout, where high chainpull loadings may be experienced, will be case hardened as required to give a longer and more reliable system operation.

Horizontal Switch Gate

POWER & FREE

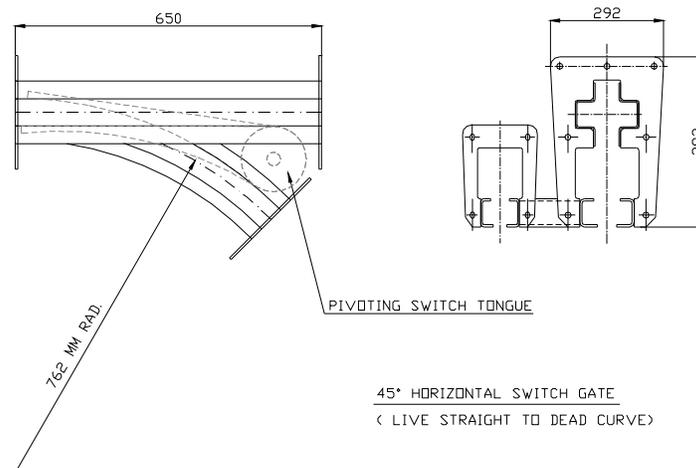
These units are used to route trolley assemblies around the system, to their relevant destinations. A track switch gate is a junction where two separate lines join.

There are two kinds of switch gate, a converging type which is a mechanical unit where trolleys merge into a single line, or a diverging type where a pneumatic cylinder is utilised to move a pivoting switch tongue.

The control of the diverging switch gate can be a simple mechanical lever or fully automated via limit switch sensors activating an electrical solenoid valve.

Dependant upon the conveyor system layout, various types of switch can be utilised when transferring trolley assemblies from one conveyor line to another, as detailed below:

- Live line (P+F) to dead track (T.O.)
- Live line (P+F) to live line (P+F)
- Dead line (T.O.) to live line (P+F)
- Dead line (T.O.) to dead line (T.O.)



The basic construction of the switch gate is similar to that of the horizontal bends, however a fabricated framework, mounting plates and central pivoting tube are incorporated to support the switch tongue and associated components.

Oven Expansion Section

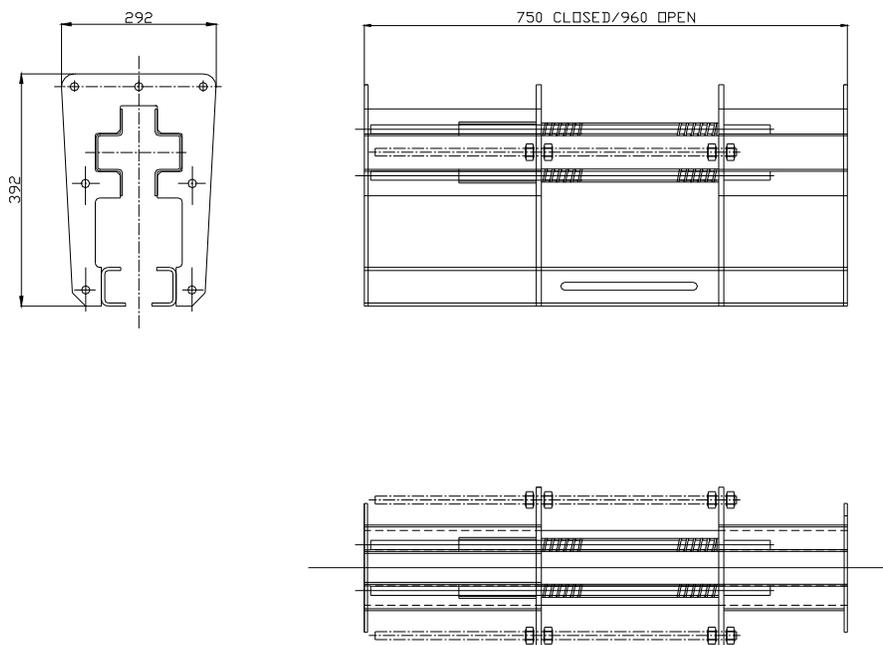
POWER & FREE

These units are designed to compensate for the expansion of the conveyor track section when installed through high temperature applications, such as curing ovens.

Dependent upon the oven size and length, at least one unit will be installed into each conveyor run within an oven. All conveyor support brackets attached to the oven structure will be designed so as to allow the conveyor track to 'slide'.

The construction of the unit is similar to that of a linear tension unit, with the use of standard track sections and square section springs over round bar to create a 'sleeved' track to allow for adjustments.

The use of a square section springs acts as an adjustable running surface for the conveyor chain load and guide rollers.



An inner and outer channel section is utilised to create an adjustable sleeve for the trolley track.

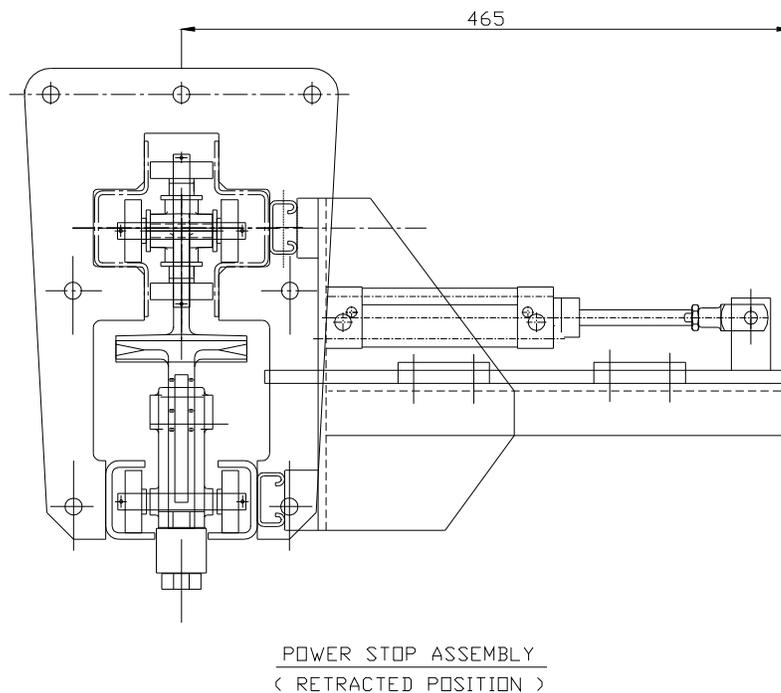
Screwed rod adjusters are utilised to set the unit to the correct length for installation purposes.

A pneumatic power stop assembly is used to create live storage and can be sited at virtually any position within a system, allowing various production processes or other functions to be carried out on the product, whilst stationary.

The general operation is simple, where a hardened steel blade can extend or retract to allow drive engagement and dis-engagement of the trolley unit. The power stop blade is actuated via a standard pneumatic cylinder.

Upon the blade extending and dis-engaging the trolley drive, all oncoming drive trolley dogs will pass over the blade and stored trolley unit, with no contact occurring.

This feature will eliminate any '*clickity click*' sounds whilst the trolley units are in live store, as the mechanical levers all lower together.



The power stop construction is fabricated from a series of folded plates and channel sections. The whole framework is then mounted onto two 'unistrut' sections, which offer flexibility for on site positioning when carrying out the system commissioning.

Automatic Shot Lubricator

POWER & FREE

The purpose of a lubricator is to allow the effective application of lubricant to the conveyor chain components to enhance the life expectancy and reliability of the conveyor system.

The proposed lubrication system for the conveyor chain allows the precise application of the lubricant directly onto the critical components of the chain, i.e. load and guide rollers and articulating joints.

An accurately measured quantity of lubricant is 'shot' onto the chain components via nozzles, which are aligned and set by our engineers during commissioning trials.

This method ensures a very accurate application of lubricant to the conveyor chain, thus considerably reducing the possibility of product contamination and reject components.

The general operation of the unit allows air to enter the pneumatic pump via a solenoid valve. The solenoid valve is controlled by a sensor, which is activated upon the detection of each pitch of conveyor chain as it passes the sensing switch.

Oil is forced, by the pneumatic pump, into the nozzles from the lubricator reservoir tank where precise volumes of oil at high velocity are very accurately discharged onto the chain components.

Each conveyor system requires its own lubrication frequency, which is dependent upon certain, variable design parameters.

- ie Conveyor Speed
- Operating Period
- Working Environment (heat etc)
- Carrying Capacities

Due to the variation in the working parameters with every conveyor system, a full on site survey will be carried out, to evaluate the lubrication frequencies, upon completion of production trials.

Lubricator Specification

Reservoir Capacity:	10 Litres.
Energy Demand:	Compressed Air 3-5 bar. 5 cu. Centimetre per actuation.
Number of Nozzles:	5 off.
Lubricant Delivery:	4 cu. mm per delivery per nozzle.
Oil Usage:	Approximately 1815mtrs of conveyor chain per full reservoir.

Chain Lubricant

We will propose the use of 'TP 1773', which in our opinion has a proven track record and when used in conjunction with our shot lubricators gives the most effective protection to the chain components whilst working in environments upto 250°C. - *Please see following specification details.*

TECHNICAL DATA SHEET - TP 1773 Oil

Description: TP1773 is specially formulated to be compatible with Electrocoat paint systems. Conventional lubricants may contribute to paint cratering or other 'paint' defects.

TP1773 is manufactured from a highly stable blend of synthetic fluids which are clean, contain no silicones or particulate, are non carbonising in use and provide wet lubrication of components subjected to elevated temperatures for prolonged periods. The material does not break down at elevated temperatures to produce hard lacquers which can at best prove difficult to remove, and at worst, build up and block oil ways thereby preventing any subsequent lubrication leading to rapid and costly wear. The extreme pressure capabilities and low evaporation characteristics exhibited by

TP1773 and its variants are provided by the use of high technology additives. Evaporation at temperatures up to 230°C is very low. This means that conveyor chains and bearings exposed to such high temperatures for extended periods will be protected by a film of synthetic fluid, and do not need to be continuously lubricated. The synthetic fluids have a very low order of toxicity.

Typical Use: TP1773 is formulated for use on oven conveyor chains, drive mechanisms, bearings, skid plates, keepers, bushes, pins, trips and wheels (linkages and cruciform bearings) which are continuously exposed to high temperatures and heavy loads. It is especially suitable for the automobile painting and assembly industries, but may also be used in the bakery industry, insulation manufacturing industry, metal container manufacturing industry and finishing industries, and elsewhere.

Method of Application: TP1773 may be applied by gravity feed or fully automated solid shot conveyor lubrication systems, brush or oil can. Spray lubrication is possible but not generally recommended.

Approval: Paint compatibility has been tested and approved by DuPont Automotive Coatings (UK) Ltd Hemel Hempstead Laboratories.

Shelf Life: This product is chemically stable, and should remain usable for at least 3 years in unopened container stored at 5°C – 30°C

Health & Safety: TP1773 is not classified as hazardous under current or proposed European legislation. However, a 16 point MSDS is available upon request.

TECHNICAL DATA_SHEET - TP 1773 (CONT'D)

Typical Characteristics.	Specification		Typical Value
Colour			Yellow/Brown
Operating Temperatures**			Continuous 230° Intermittent
250°C			
Kinematic Viscosity	IP71/87	40°C 100°C	215 Cst. 17 Cst.
Four Ball Wear Test	ASTM D4172	40kg/1hr	0.41mm
Specific Gravity	IP365/85	25°C	0.96
Flash Point	IP35/63	---	>265°C
Pour point	IP15/67	---	<-20°C
Copper Strip Corrosion	ASTM D130-68		1a

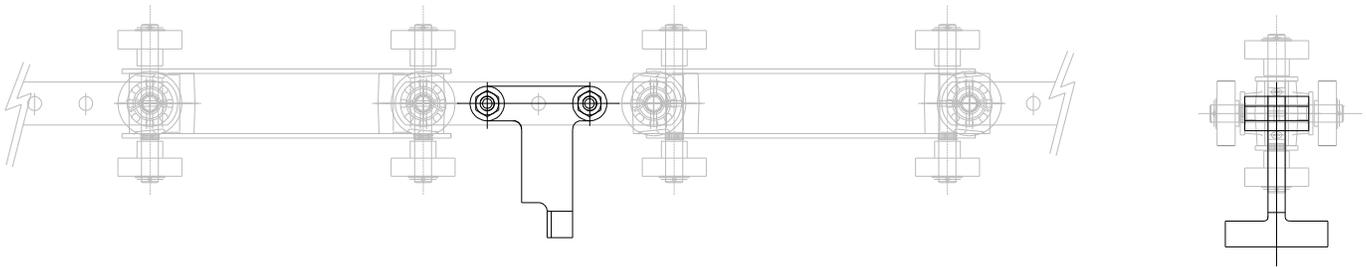
Note:** These temperatures refer to the oil film on the chain. The oven temperature may be considerably higher than this. It is necessary to apply fresh material at a frequency influenced by the operating environment. The word 'continuous' does not imply lubrication "for life".

Trolley Drive Dog

POWER & FREE

Trolley driving dogs are used as a traction medium for the power and free load trolley assemblies. The drive dogs are bolted between the conveyor chain side links at a standard pitch of 406mm, or a multiple thereof, dependent upon the specific application.

If required, intermediate-driving dogs can be fitted into the conveyor chain at 203mm increments, however please consult Jade Industries Ltd. if this is a requirement for the operating parameters of the system.



The trolley driving dogs are cast from a malleable iron, therefore giving a hard wearing, strong reliable component.

Trolley and Loadbar Assembly

POWER & FREE

The products passing around the conveyor system will be transported on a trolley and loadbar assembly, which will be capable of bearing the full load of the product and associated jiggings and allow engagement and dis-engagement of drive on the conveyor chain.

The standard arrangement will comprise leading, intermediate and trailing trolleys, coupled together by a series of loadbars.

Leading Trolley

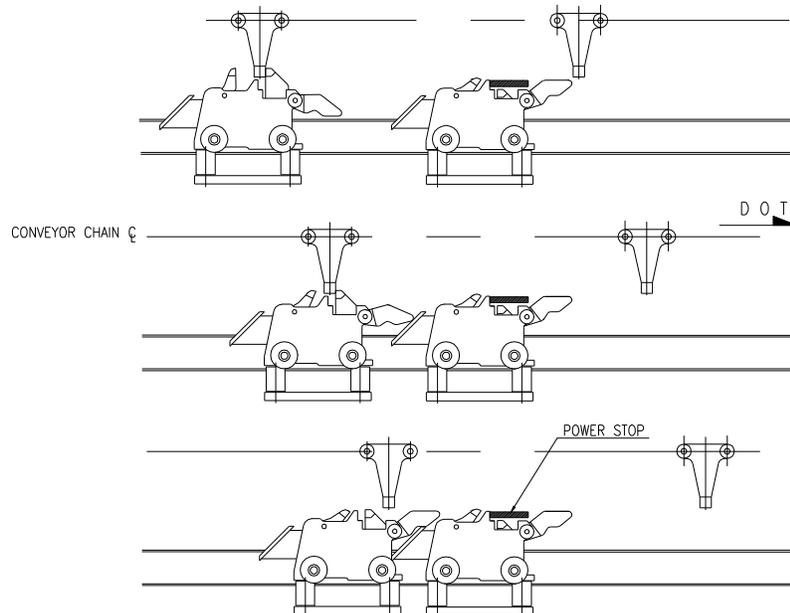
This trolley allows the driving pusher dog to engage and push it around the conveyor system, with the facility to uncouple the drive at specific points via the activation of a power stop.

The engagement and dis-engagement of drive is achieved through a series of mechanical levers, which raise and lower according to the driving requirement.

An anti run away pawl is also incorporated into the trolley design, which is used to control the trolley movement when negotiating vertical rise and fall sections.

The main body of the trolley is of a cast construction giving a hard wearing, strong and reliable operation. The body is carried by four load rollers, with two additional rollers being used as the guiding medium for the trolley.

A primary loadbar is mounted beneath the trolley body onto which various attachments can be taken, dependant upon the product to be handled.



Intermediate Trolley

The purpose of the intermediate trolley will be to create the required load bearing capacity and to support the other end of the product loadbar.

Similar in appearance to the leading trolley, however, there are no mechanical levers or anti run away pawls. This trolley is a fabricated unit, again with four load rollers and a pair of guide rollers.

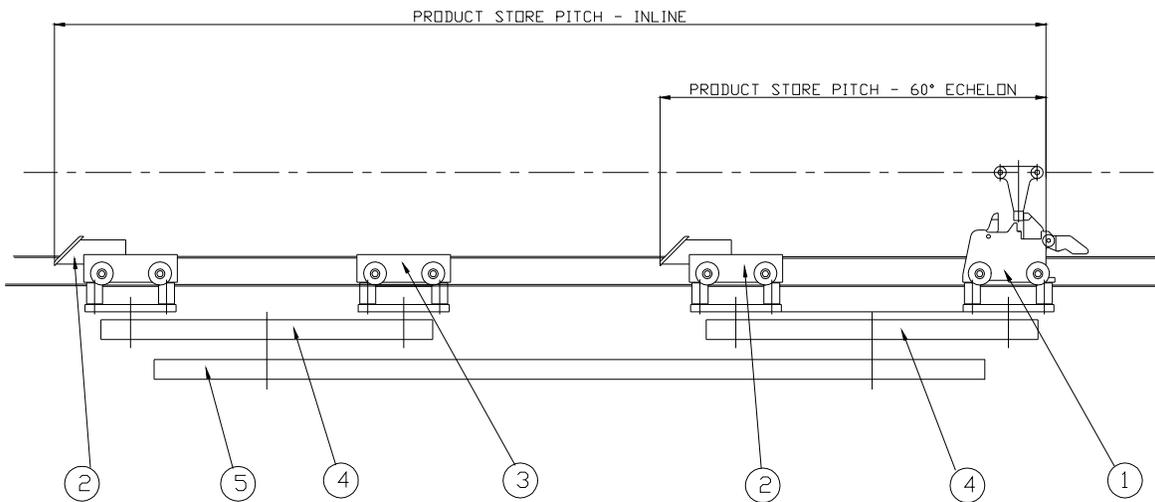
The product loadbar is attached to the primary trolley loadbar via an articulating fixing, therefore allowing the trolley to negotiate horizontal and vertical bends.

Trailing Trolley

The main function of the trailing trolley is to create the correct storage pitch of the products being handled, ensuring a clearance between trolley assemblies whilst in accumulation.

A secondary loadbar is used to connect the trailing and intermediate trolleys.

The trailing trolley is a fabricated unit similar to the intermediate trolley, however, it incorporates a dis-engaging ramp, which is used to raise and lower the mechanical levers on the leading trolley when entering a storage mode.



Item No.

Description

- | | |
|---|----------------------|
| 1 | Leading Trolley |
| 2 | Trailing Trolley |
| 3 | Intermediate Trolley |
| 4 | Secondary Loadbar |
| 5 | Product Flightbar |

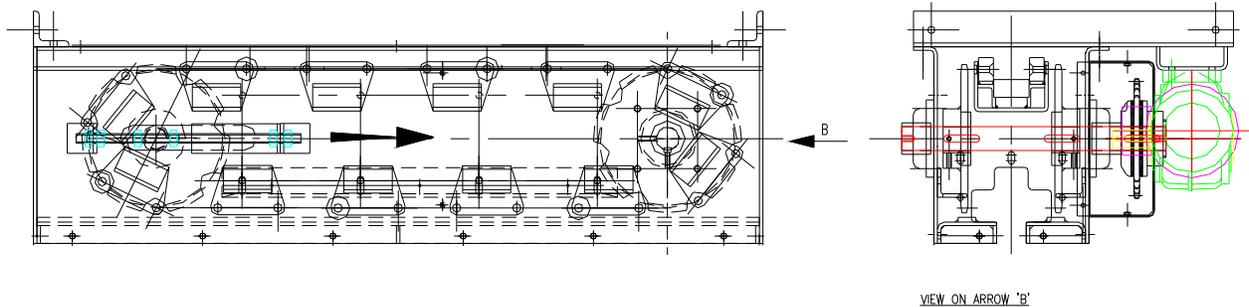
Caterpillar Drive Unit

CHAIN ONLY

The caterpillar drive unit offers an exceptionally smooth, reliable operation and positional flexibility as it is not restricted to a horizontal bend as a sprocket drive will be.

The drive unit consists of a folded plate body onto which is mounted a motor gearbox and a series of sprockets, chains and driving dogs.

The driving dogs are fixed between two transmission chains and are allowed to 'straddle' the conveyor chain when engaging into the driving position. This feature enables the driving dogs centre line to match the conveyor chain so reducing the reactional loading into the drive unit.



An overload protection device is utilised in case of a conveyor chain jam and also accommodates for slippage during normal running.

All sprockets & chains will be fully guarded to conform to current Health + Safety and CE mandatory requirements. With identification labels fitted to the drive unit confirming manufacturing and customer details, allowing future information retrieval for maintenance and service work to be more efficient.

Tension Unit

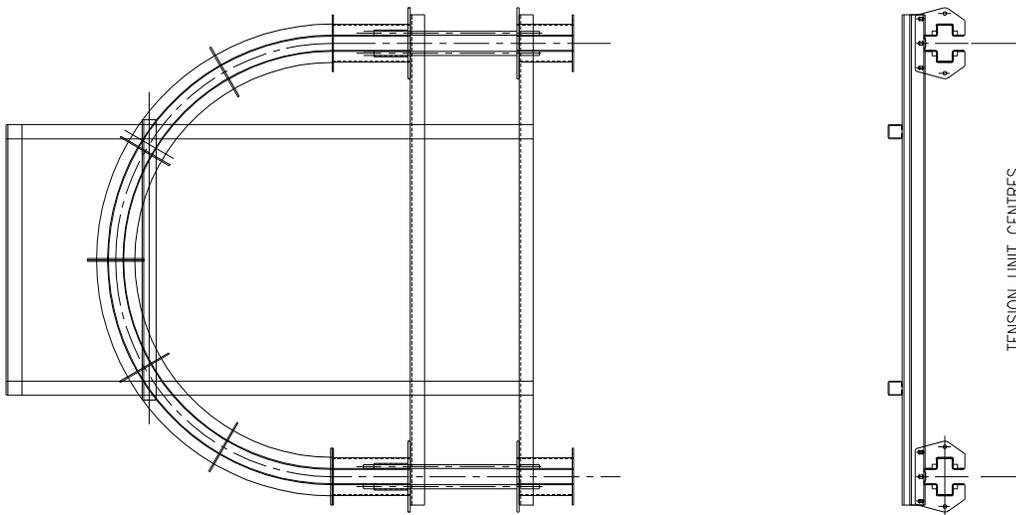
CHAIN ONLY

The tension unit design incorporates an adjustable sliding track section, which enables ease of chain adjustment, ensuring the optimum tension within the conveyor system to be achieved.

The basic construction consists of a fabricated framework onto which is mounted two 'sleeved' track sections. Attached to these two sections is a 180° horizontal bend, which is supported from a moving carriage and is allowed to float.

This framework allows chain tensioning to be carried out without the necessity to adjust any conveyor supports. 8 off x square section springs allow for the correct chain tension to be achieved.

The design of the tension unit allows a single pitch of chain (406mm) to be removed from the system as required.



Screwed rod adjusters and square section springs allow the tension unit to be set and locked off, as a fixed bend if the system is required to travel in reverse.

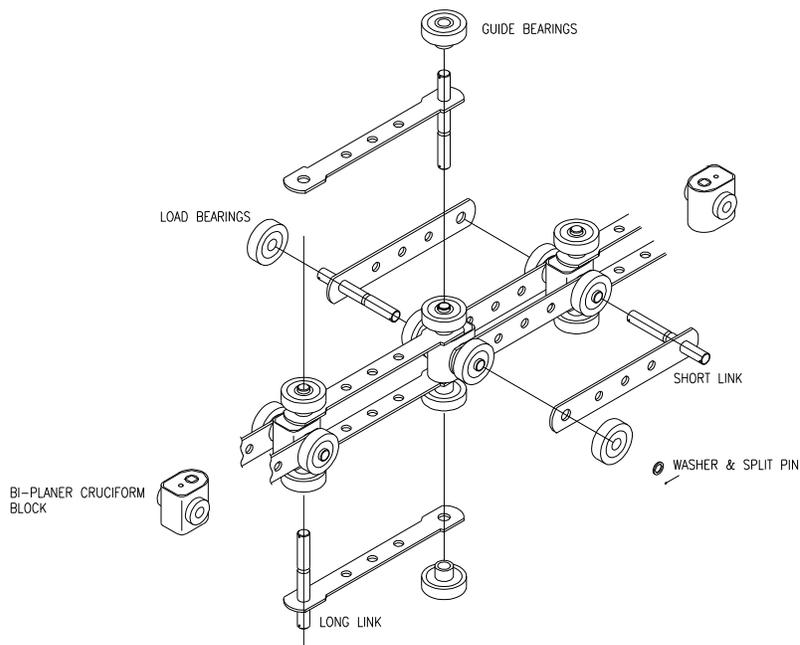
Conveyor Chain

CHAIN ONLY

The standard *Powertrack 100* conveyor chain is a fully bi-planar type, allowing it to negotiate all horizontal and vertical curves within a system layout.

Standard *Powertrack 100* conveyor chain has a maximum working chainpull of 454kg, giving a safety factor over the ultimate loading of 9:1.

Various components, as indicated below, are required for the assembly of the conveyor chain.



Item No.

Description

1	'Guide' Roller Bearing
2	'Load' Roller Bearing
3	Articulating Cruciform
4	Short (Load) Link
5	Long (Intermediate) Link
6	Bearing Washer
7	Retaining Split Pin

Conveyor Chain

CHAIN ONLY

Chain Roller Bearings

The proposed conveyor system as detailed here-in, will operate utilising a standard PT100 type roller fitted to all load and guide spindles. The roller will be an open, semi precision type bearing.

Chain Side Links

The conveyor side links will be punched from high tensile strip steel section and will have a thickness of 3mm.

An axle or spindle, which is case hardened for greater life expectancy is coined into one end of the chain link, thus captivating it and therefore eliminating the possibility of it rotating in the link.

Chain Cruciform

The chain cruciform acts as a universal joint, which allows the spindles to articulate when negotiating horizontal and vertical bends. Free movement of the spindles within the cruciform is of paramount importance to give optimum running of the conveyor chain.

With this in mind, lubricant application to these critical areas must be ensured to give reliability to the system's operation.

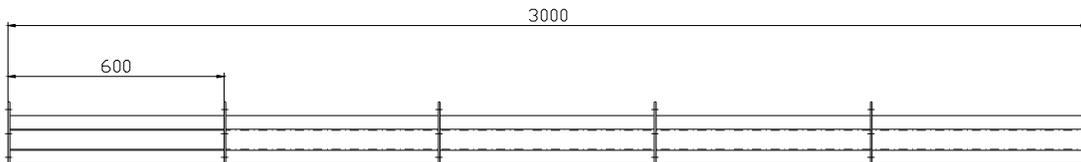
This function can be carried out effectively with the use of our shot type lubricators which ensures seizure is unlikely to take place.

Straight Track

CHAIN ONLY

The track section is made up from two accurately cold rolled 'Top Hat' sections, which are placed on their sides. The two sections are then spaced apart by flange plates nominally pitched at 600mm.

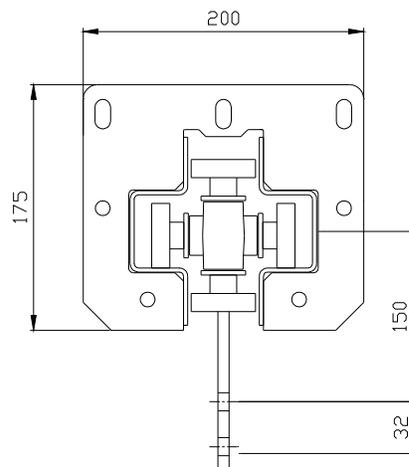
All the components are jig aligned and welded into standard 3000mm long sections, with variable lengths being cut and jig welded as required for make-up lengths within a conveyor circuit.



Each flange plate has 7 off holes which are used to bolt together each track joint, using 10mm fixings. By incorporating 3 off slotted holes along the top of the flange final height adjustment may be achieved during the conveyor installation.

All internal running surfaces are aligned to ensure smooth running, prior to final tightening of each joint, by our installation engineers.

The intermediate track flange plates may be utilised for fixing support brackets or ancillary items as required.



Material Specification

Conveyor Track - Mild Steel HR15 Pickled and Oiled - 3 mm thick.
Track Flange Plate - Mild Steel - 5 mm thick.

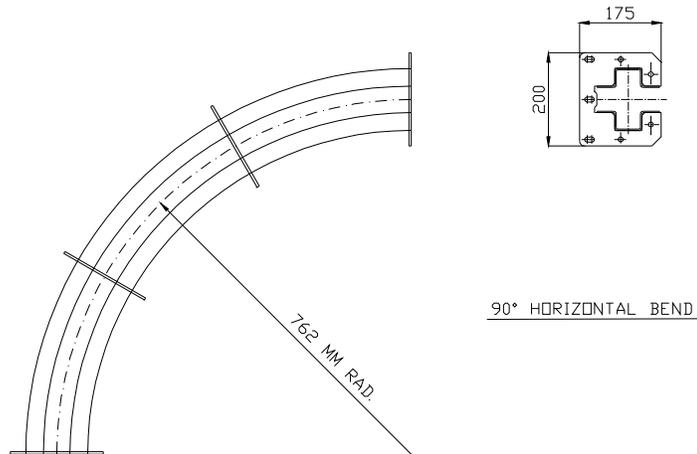
Finish

All conveyor track sections will be powder coated as standard.

Horizontal and Vertical Bends

CHAIN ONLY

The configuration of the conveyor bends will be identical to that of the straight track, with the top hat section being rolled to the required radii and coupled with standard flange plates to be jig aligned and welded into a bend assembly.

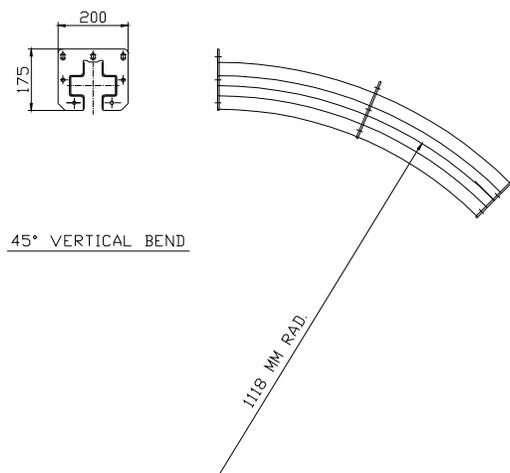


Standard bend radii and angles are available, however non standard units or composite type bends can be supplied if required.

Standard Radii	-	Horizontal	762mm
	-	Vertical	1118mm

Standard Angles	-	15°, 30°, 45°, 60° and 90°
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When a change in direction of the conveyor routing is required, from horizontal to vertical planes, it is essential that a minimum length of 300mm of straight track is incorporated between horizontal and vertical bends.



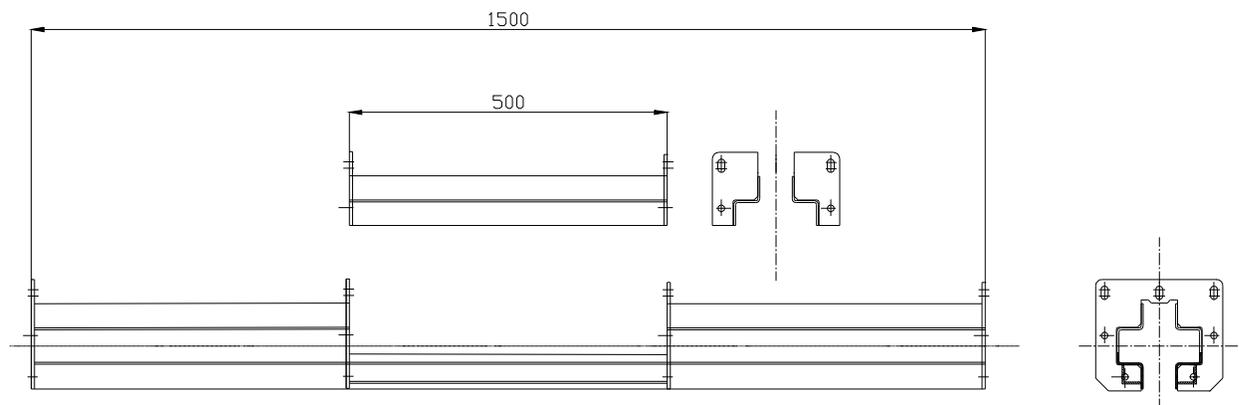
All bends positioned within a conveyor system layout, will be case hardened as required to give a longer and more reliable system operation.

Inspection Section

CHAIN ONLY

Conveyor track inspection sections are incorporated into a system at approximately 60 metre interval allowing for routine inspection and maintenance tasks to be carried out to the conveyor chain.

The track section will comprise of standard top hat and flange plate components, however, a removable top cover will be used to gain access to the conveyor chain.



This removable cover may be unbolted during maintenance operations.

Maintenance Access Platform

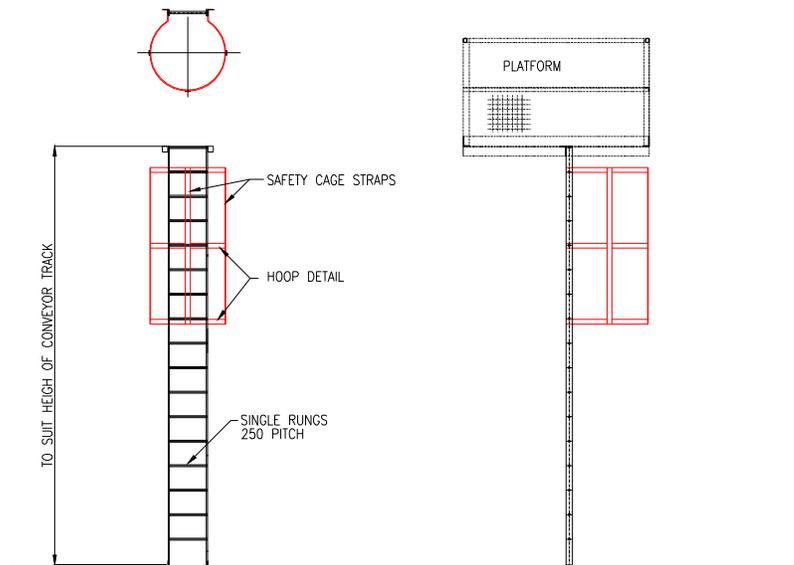
CHAIN ONLY

The conveyor drive units within the system layout will have a maintenance platform installed allowing ease of access for routine maintenance tasks.

The general construction will consist of a working platform, with a safety kick plate and handrail mounted around the perimeter of the structure.

Standard channel and hollow sections, plates and angles will be used to manufacture the platform, with a flowforge type base being utilised as the base material.

A personnel hooped ladder will be installed to enable access to be gained to the platform for carrying out maintenance operations.



TYPICAL PLATFORM DETAILS

Item No. 1 - Floor Mounted Support Stanchions

Typically, all conveyor runs external to the process plant will be supported from floor mounted support stanchions, which will be of a suitably rated fabricated construction comprising standard rolled hollow section and baseplate materials.

All support base plates will be fixed to the factory floor utilising M12 type concrete floor anchors.

It will be our intention to provide a system plan layout indicating all floor mounted support positions, which will take into account operator working areas, access requirements and will ensure optimum use of floor space.

Generally, floor mounted supports will be utilised at the all load and un-load areas, and all routes into and out of the plant.

Item No. 2 -Process Plant Equipment

A set of plant support brackets will be utilised to support the conveyor and load through all plant enclosures. Standard oven expansion brackets will be utilised within the heat treatment oven, therefore, allowing the correct movement of the conveyor track through expansion and contraction due to the extreme working environment.

All details of these supports and structural requirements will be confirmed with yourselves during the course of the contract.

It has been assumed that the plant enclosures will be adequately rated to support the conveyor and load.