OLEO INTERNATIONAL

LEADING THE WORLD IN ENERGY ABSORPTION

END STOPS

OLEO INTERNATIONAL

Oleo is a leading expert in energy absorption technology supplying to the rail, industrial and elevator business sectors.

Our ongoing investment in research and development ensures that we are continually updating our designs and introducing new products and services to our portfolio.

We will work with you to ensure that the most efficient method of energy absorption is developed to meet your specification.

WE PROVIDE SOLUTIONS – NOT JUST PRODUCTS.

We sell worldwide through our offices in the United Kingdom, China, India, Germany and the USA and through a wide range of distributors.

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INTRODUCTION

Many passenger and freight locations are terminal (end of line) situations, on the rare occasions the train fails to stop or slow down sufficiently the risk is that it collides with or overrides the end of the platform/line.

Fitting efficient and effective end stops will protect passengers, rolling stock and infrastructure in the event of a train failing to stop.

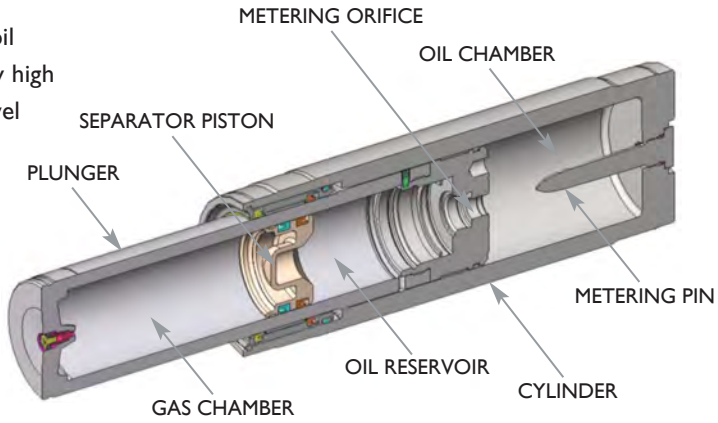
End stops can be frequently found in docks and ports at the end of rails where cranes travel and railway lines are used to deliver coal or cargo to a port. They can also be used in factories and steel mills in conjunction with cranes and major machinery in order to take out some of the high stresses that the buildings can endure when the cranes are reaching the end of their travel.

Please contact us to discuss your requirement and we will work with you to produce an end stop solution to your specification

HYDRAULIC OPERATING PRINCIPLE

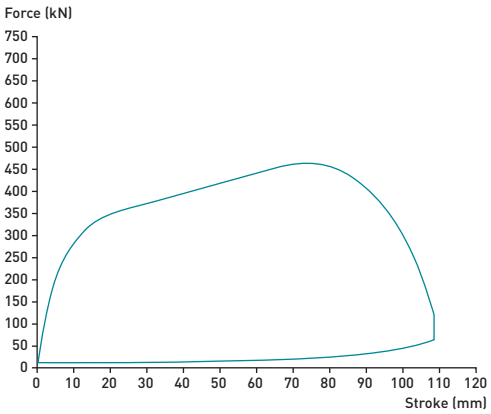
The illustration shows the robust construction of the Oleo hydraulic unit, upon impact the plunger is forced into the cylinder displacing oil through the orifice thereby moving the separator piston and compressing the gas. The compressed gas acts on the oil through the separator piston to give recoil force to re-extend the unit after impact. The energy absorbed and dissipated being dependent on the closure velocity.

When the plunger is forced into the cylinder rapidly the oil displaced by the plunger passes through the orifice at very high velocity so raising the pressure in the oil chamber to a level which optimises the closure force of the unit. This optimisation process ensures that the impact energy is absorbed evenly throughout the plunger travel thus maintaining a level impact force; a very useful feature accomplished by Oleo's innovative metering designs which progressively alter the flow area as the unit closes. The actual metering designs are precisely calculated to provide the best possible protection at specified impact speeds.

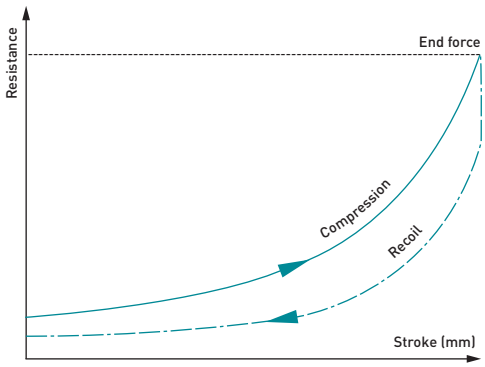


The Oleo hydraulic unit therefore possesses the unique feature that its characteristics change according to operational needs, the majority of the impact energy being absorbed within the unit so the already low recoil force is damped by the reverse flow of oil leaving very little energy and recoil force to be returned to the impacting vehicle.

DYNAMIC DIAGRAM



STATIC DIAGRAM



SLIDING FRICTION END STOPS

The sliding friction end stop is designed to dissipate the impact energy in a controlled manner via the sliding action of the friction shoes fitted between the frame and rail profile. This can be used in conjunction with Oleo hydraulic energy absorption systems to provide a recoverable stroke for impacts up to 25 km/h and controlled sliding distances for high speeds.

Used on Metro Madrid Series Trains 5000, 6000, 7000, 8000 and 9000. Incorporating Oleo hydraulic unit (one Type 9 – Recoverable stroke 400mm). Train mass range between 163 tonnes and 216 tonnes. Impacting speed maximum 15 km/h. Installation length: 7.1 metres. Impact capacity 224 kJ.

Typically used on metro lines – designed for centre impact only. Sliding friction end stop (twenty friction shoes) incorporating Oleo hydraulic unit (single Type 9 – Recoverable stroke 400 mm). Train mass: 220 tonnes. Impacting speed: 25 km/h. Installation length: 16 metres. Impact capacity: 224 kJ.

Typically used on European main lines (freight) – designed for side impact only. Sliding friction end stop (eight friction shoes) incorporating Oleo hydraulic units (two Oleo Type 9 – Recoverable stroke 400 mm). Train mass: 220 tonnes, Impacting speed: 25 km/h, Installation length: 25 metres, Impact capacity: 448 kJ.

Friction shoes are located within fabricated 'pockets' on the end stop main frame. These are fitted around the rail profile and secured with three fixings to pre-defined settings to achieve the correct retardation value in relation to the design calculations.

Each pair of friction shoes can achieve up to 50kN of braking force, the amount of impact energy to be dissipated will determine the number to be used.

Secondary friction shoes positioned behind the main unit can also be utilised to assist in dissipating the impact energy.

Anti climber shoe assemblies are also fitted to the front of the end stop main frame and clamped around the rail profile to prevent 'uplift' on impact.

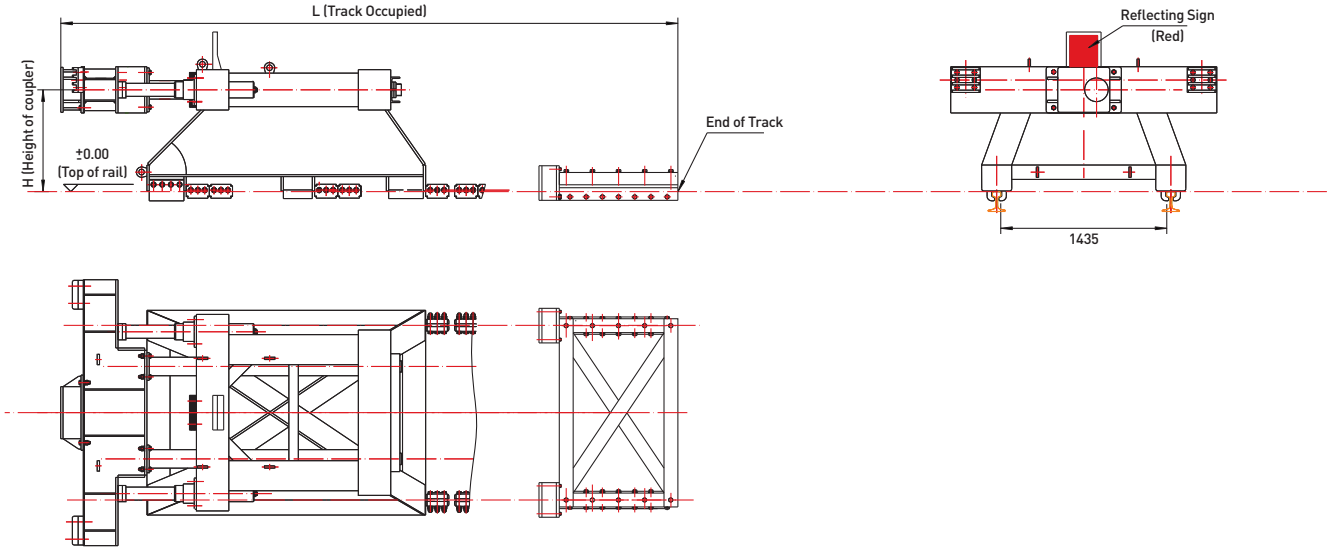
The friction shoes and anti climber shoe assemblies are suited to most types of rail profile and can be reused after an impact – subject to inspection and in accordance with the user manual.

Typically used for main lines – designed for centre impact only. Sliding friction end stop with nine pairs of friction shoes and one pair of anti climber shoes at the front. Incorporating Oleo hydraulic units (two Oleo Type 9 – Recoverable stroke 400mm). Train mass: 535 tonnes, Impacting speed: 25km/h, Installation length: 16metres, Impact capacity: 448kJ.

Detail of friction shoes and anti climber assembly.

SLIDING FRICTION HYDRAULIC END STOP DESIGNS

LARGE FRAME FOR HIGHER SPEEDS



- Contains one pair of anti climber shoes, two Oleo Type 9 hydraulic buffers and one set of XCD fixed stop friction shoes.
- Impacting point from the top of the rail (coupler height): mm (720 – 660 – 824)

Examples for conditions and installation length:

1) 8 CARS

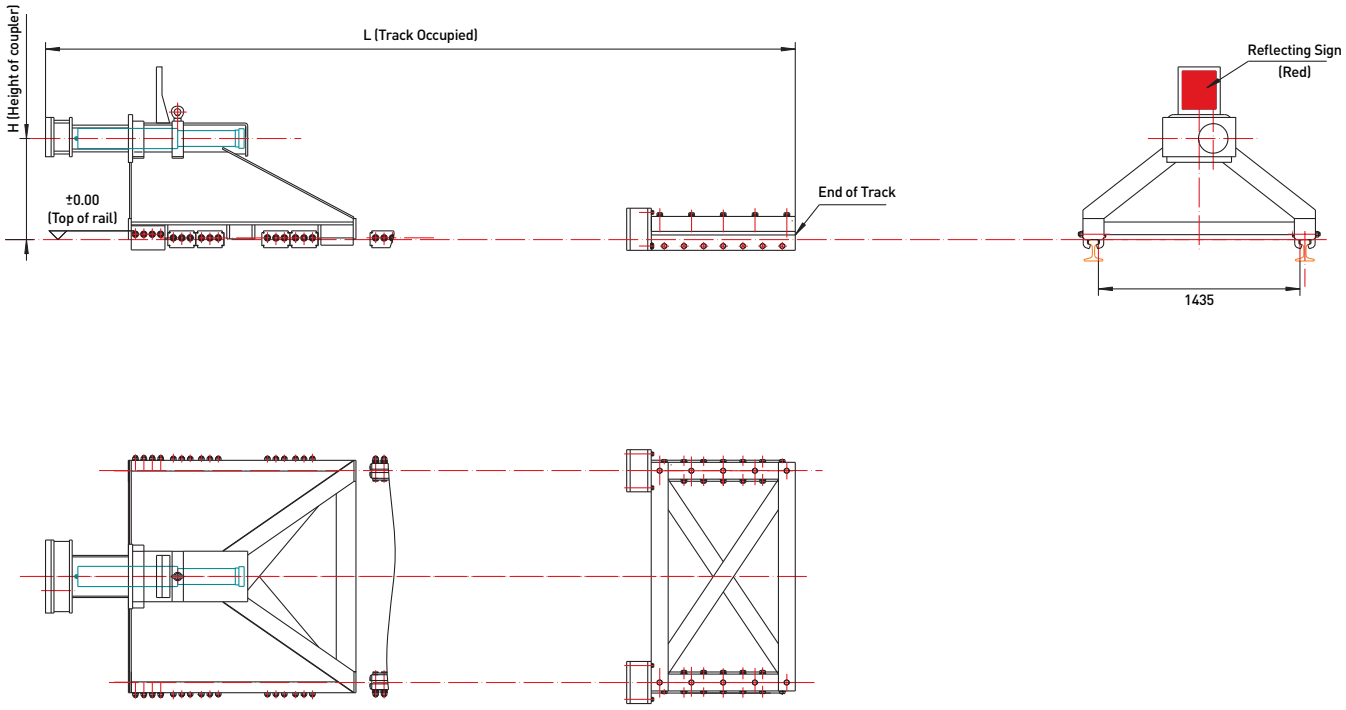
- For cars with passengers. Train mass 510 tonnes, Impacting speed 25 km/h, Installation length 25 m, Impact capacity: 448 kJ, Recoverable Stroke: 400 mm
- For cars without passengers – testing line Train mass: 300 tonnes, Impacting speed: 25 km/h, Installation length: 18 m, Impact capacity: 448 kJ, Recoverable Stroke: 400 mm
- For cars with passengers. Train mass: 510 tonnes, Impacting speed: 15 km/h, Installation length:15 m, Impact capacity: 448 kJ, Recoverable Stroke: 400 mm

2) 6 CARS

- For cars with passengers. Train mass: 380 tonnes, Impacting speed: 25 km/h, Installation length: 15 m, Impact capacity: 448 kJ, Recoverable Stroke: 400 mm.
- For cars without passengers – testing line. Train mass: 220 tonnes, Impacting speed: 25 km/h, Installation length: 15 m, Impact capacity: 448 kJ, Recoverable Stroke: 400 mm.
- For cars with passengers. Train mass: 380 tonnes, Impacting speed: 15 km/h, Installation length: 15 m, Impact capacity: 448 kJ, Recoverable Stroke: 400 mm.

SLIDING FRICTION HYDRAULIC END STOP DESIGNS

SMALL FRAME FOR LOWER SPEEDS



- Contains one Oleo Type 9 hydraulic buffer and one set of XCD fixed stop friction shoes.
- Impacting point from the top of rail (coupler height) mm (720 – 660 – 824)

Examples for conditions and installation length:

1) 8 CARS

- For cars with passengers. Train mass: 510 tonnes, Impacting speed: 15 km/h, Installation length: 15 m, Impact capacity: 224 kJ, Recoverable Stroke: 400 mm.
- For cars without passengers. Train mass: 300 tonnes, Impacting speed: 15 km/h, Installation length: 15 m, Impact capacity: 224 kJ, Recoverable Stroke: 400 mm.

2) 6 CARS

- For cars with passengers. Train mass: 369 tonnes, Impacting speed: 15 km/h, Installation length: 15 m, Impact capacity: 224 kJ, Recoverable Stroke: 400 mm.
- For cars without passengers. Train mass: 220 tonnes, Impacting speed: 15 km/h, Installation length: 15 m, Impact capacity: 224 kJ, Recoverable Stroke: 400 mm.
- For cars with passengers. Train mass: 510 tonnes, Impacting speed: 15 km/h, Installation length:15 m, Impact capacity: 448 kJ, Recoverable Stroke: 400 mm.

SLIDING FRICTION END STOP NON-HYDRAULIC

This type of end stop is typically used on metro and main lines – designed for different centre and side impacts with anti climbers (if required). Pure friction only, the number of friction shoes will depend on the train mass, impacting speed and the required deceleration.

Train mass: 408 tonnes Impacting speed 25 km/h fitted with seventeen pairs of friction shoes with an installation length of 15 m.
Train mass: 252 tonnes Impacting speed 15 km/h fitted with eleven pairs of friction shoes in an installation length of 15 m.

Train mass: 450 tonnes Impacting speed 15 km/h fitted with eight pairs of friction shoes with an installation length of 15 m.

FIXED END STOP

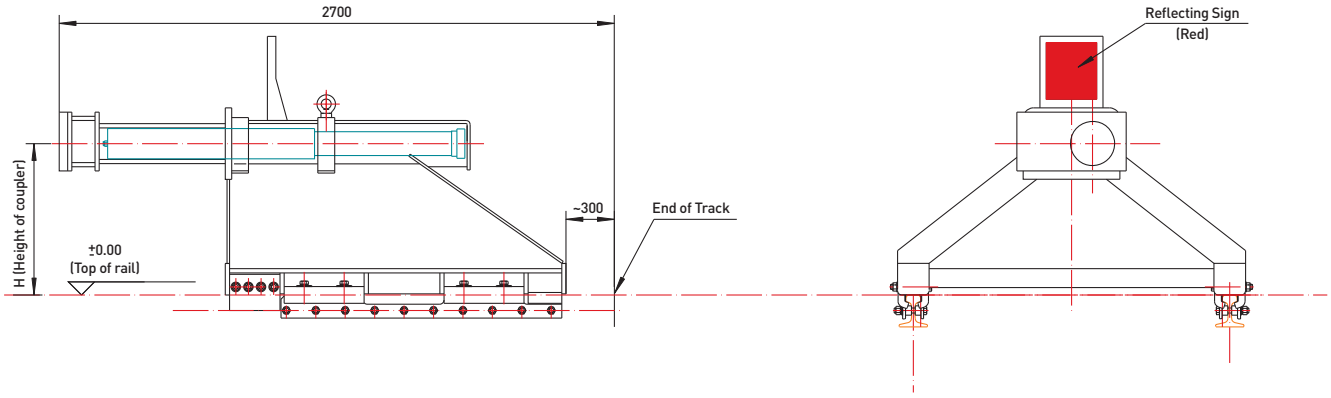
Fixed end stops are essentially 'end of line' systems with frames fixed directly onto the rails, these type of end stops have no energy absorbing ability unless used in conjunction with Oleo hydraulic energy absorption systems to dissipate the impact energy. These systems have the ability to self-reset after impact.

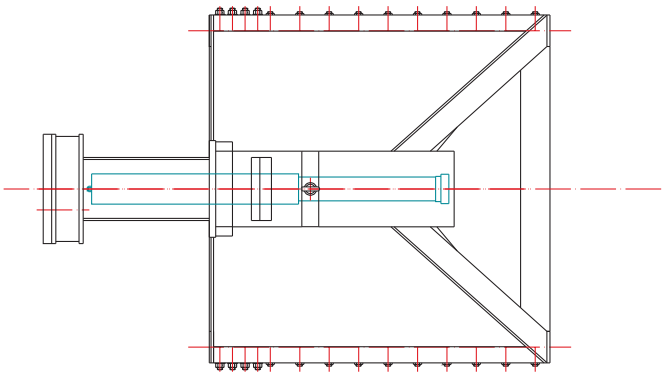
Typically used on 'end of line' – designed for centre impact only. Fixed end stop incorporating Oleo hydraulic units (one Oleo Type 76 – Recoverable stroke 600mm). Train mass: 300 tonnes, Impacting speed: 5km/h, Installation length: 2.8metres, Impact capacity: 336kJ.

Typically used on low speed test lines – designed for centre and side impact. Fixed end stops incorporating Oleo hydraulic units (two Oleo Type 718 – Recoverable stroke 1800mm). Installation length: 5.5m, Impact capacity 2016kJ.

Typically used on depot/maintenance workshop – designed for centre impact only. Fixed end stop incorporating Oleo hydraulic unit (single Oleo Type 76 – Recoverable stroke 600mm). Installation length: 2.7metres, Impact capacity 336kJ.

FIXED END STOP DESIGNS





- Contains one Oleo Type 76 hydraulic buffer.
- Impacting point from the top of rail (coupler height) mm (720 – 660 – 824)
- Maximum energy absorbed by buffer: 336 kJ
- End force: 700 kN
- Recoverable stroke: 600 mm

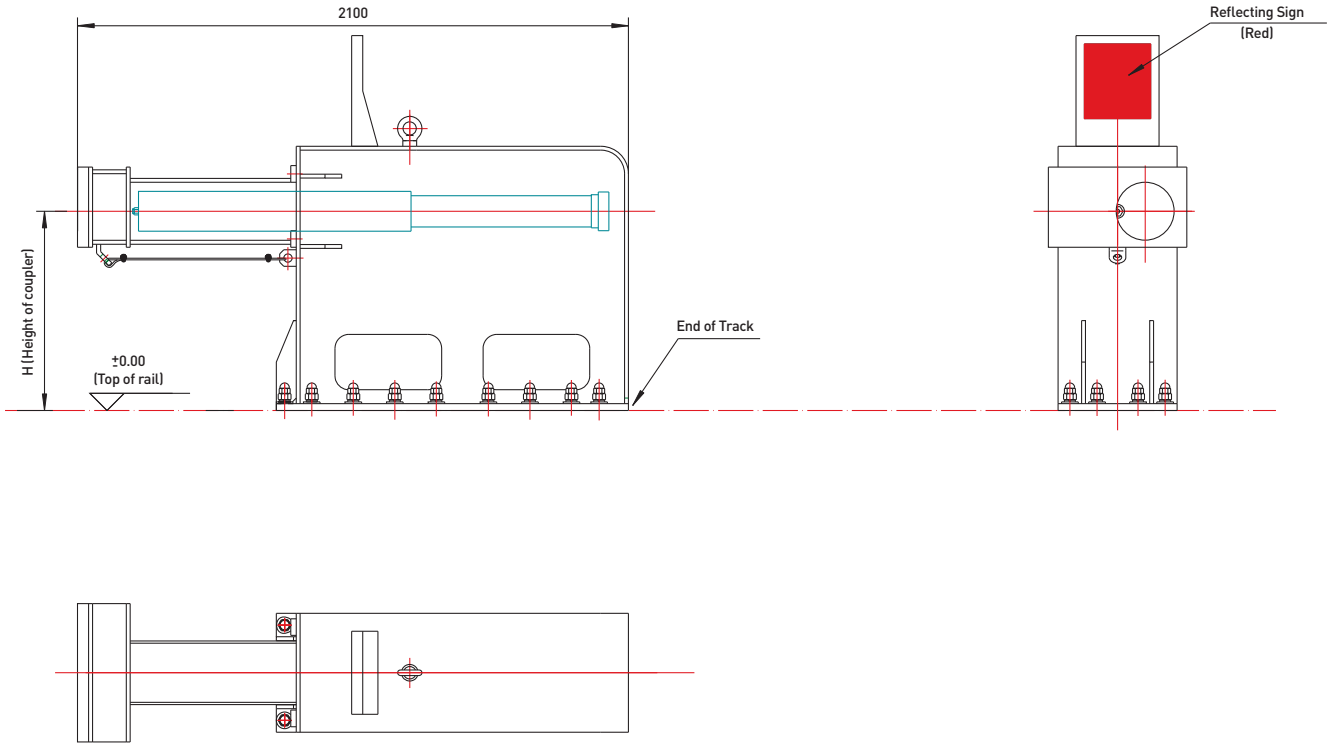
Examples for conditions and installation length:

1) 8 CARS

- Depot or maintenance workshop. Train mass: 300 tonnes, Impacting speed 5 km/h, Installation length: 2.7m, Impact capacity: 336 kJ, Recoverable stroke: 600 mm.

2) 6 CARS

- Depot or maintenance workshop Train mass: 220 tonnes, Impacting speed 6 km/h, Installation length 2.7m, Impact capacity: 336 kJ, Recoverable stroke: 600 mm.



- Contains One Oleo Type 76 hydraulic buffer and one set of steel embedded part.
- Reinforced concrete base for steel embedded part needed.
- Impacting point from the top of rail (coupler height) mm (720 – 660 – 824)
- Maximum energy absorbed by buffer: 336kJ
- End force: 700kN
- Recoverable stroke: 600mm

Examples for conditions and installation length:

3) 8 CARS

- Depot or maintenance workshop – parking area. Train mass: 300 tonnes, Impacting speed 5km/h, Installation length: 2.1m, Impact capacity: 336kJ, Recoverable stroke: 600mm.

4) 6 CARS

- Depot or maintenance workshop – parking area. Train mass: 220 tonnes, Impacting speed 6km/h, Installation length 2.7m, Impact capacity: 336kJ, Recoverable stroke: 600mm.

FIXED END STOP WITH CONCRETE BASE FOUNDATION

Oleo hydraulic energy absorption systems are used to dissipate the impact energy supported on a fixed concrete base foundation. These are generally used in conjunction with a 'buffing beam' or 'buffing trolley' to interface with rolling stock. These systems have the ability to self-reset after impact.

Design advice can be provided in relation to the concrete base foundation

Typically used on metro and main line – designed for centre and side impact. Concrete base foundation incorporating Oleo hydraulic units (two Oleo Type 718 – Recoverable stroke: 1800mm). Train mass: 267 tonnes, Impacting speed: 12km/h, Impact capacity: 2016kJ, Installation length: 5.5m.

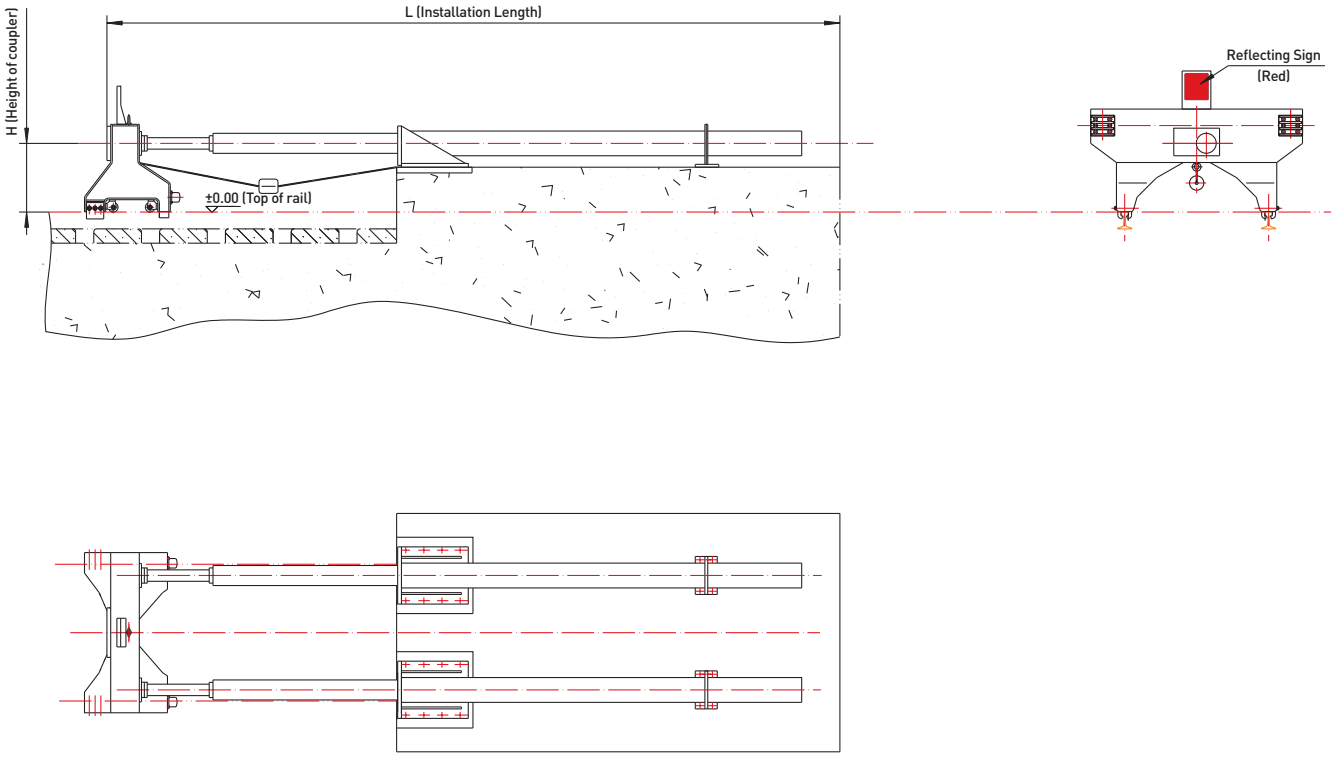
Typically used on metro and main lines – designed for centre and side impact. Concrete base foundation incorporating Oleo hydraulic units (two Oleo Type 724 – Recoverable stroke 2400mm). Train mass: 300 tonnes, Impacting speed: 14km/h, Installation length: 8metres, Impact capacity 2688kJ.

Typically used on metro, main line and depots – designed for centre and side impact. Concrete base foundation incorporating Oleo hydraulic units (three Oleo Type 712 – Recoverable stroke: 1200mm). Train mass: 1000 tonnes, Impacting speed: 1.94m/s, Impact capacity 2016kJ, Installation length: 3.5m.

Typically used on metro and main lines – designed for centre and side impact. Concrete base foundation incorporating Oleo hydraulic units (two Oleo Type 730 – Recoverable stroke 3000mm). Train mass: 510 tonnes, Impacting speed: 12km/h, Installation length: 9.5metres, Impact capacity 3360kJ.

This project involved the client designing their own steel structure which was mounted onto a concrete base. Designed for centre impact incorporating Oleo hydraulic units (two Oleo Type 76 units – Recoverable stroke 1200mm). Train mass: 115 tonnes, Impacting speed: 8km/h, Installation length: 3.5metres, Impact capacity 672kJ, End force: 700kN.

CONCRETE BASE FOUNDATION INCORPORATING HYDRAULIC UNITS DESIGN



- Contains 1 off 'buffing trolley', two long stroke hydraulic buffers and one set of steel embedded part.
- Reinforced concrete base for steel embedded part.
- Impacting point from top of rail (coupler height) mm (720 – 660 – 824)

Examples for conditions and installation length:

1) 8 CARS

- Type Oleo 730 Maximum energy absorbed 3360kJ, Train mass: 510 tonnes, Impacting speed 12km/h, Installation length: 9.5m, Recoverable stroke 3000mm.
- Type Oleo 724 Maximum energy absorbed 2688kJ, Train mass: 300 tonnes, Impacting speed 14km/h, Installation length: 8m, Recoverable stroke: 2400mm.

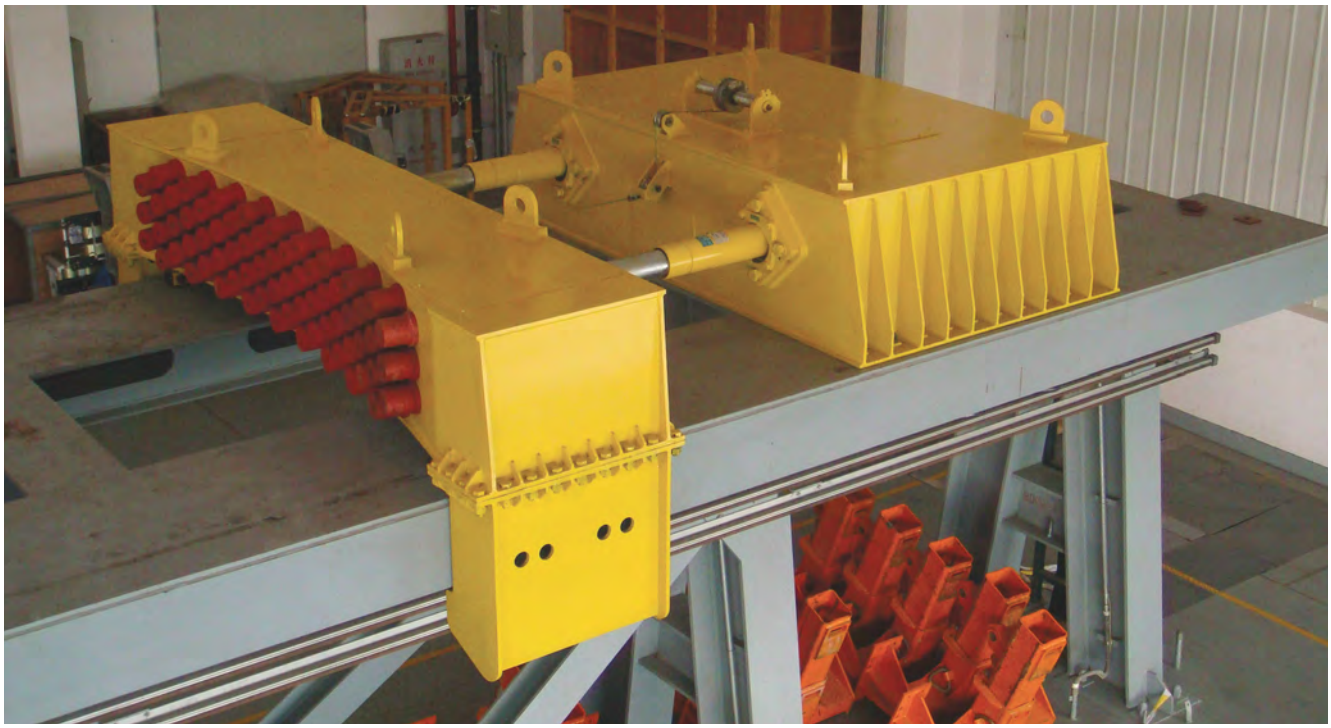
2) 6 CARS

- Type Oleo 724 Maximum energy absorbed 2688kJ, Train mass: 380 tonnes, Speed 13km/h, Installation length 8m, Stroke 2400mm or Train mass 220 tonnes, Speed 16km/h, Installation length 8m, Stroke 2400mm.

BESPOKE END STOPS

End stops are 'safety critical' and can be designed to meet specific project criteria and design requirements. Please contact us to discuss your requirement and we will work with you to produce an end stop to your specification.

This end stop was designed to support a specific rebuilding project to create an old style tram in Beijing – designed for centre impact with rubber softener. Fixed end stop incorporating Oleo hydraulic unit (one Type 54 – Recoverable stroke 400mm). Impact capacity: 160kJ.

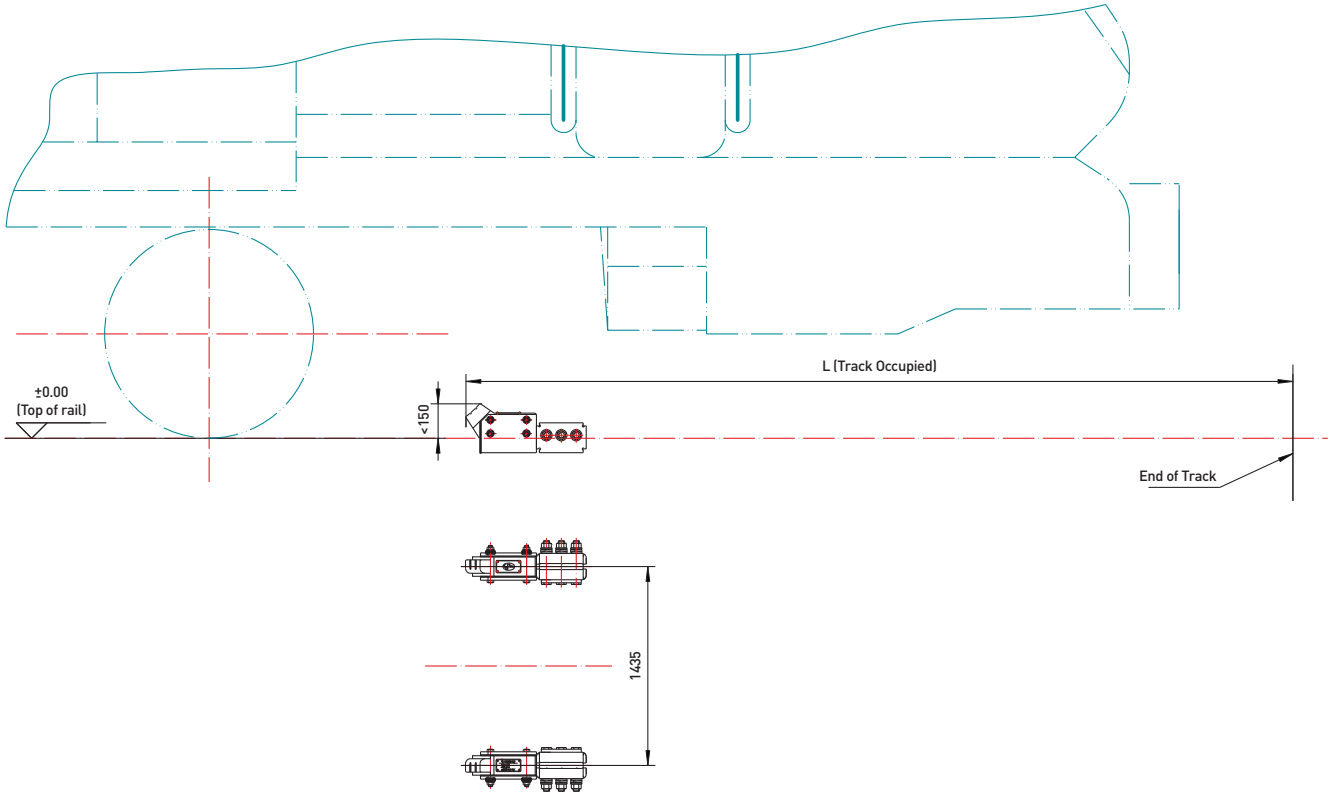


Typically used on 'test line' for Shanghai Maglev – designed for front face impact only. Fixed end stops incorporating Oleo hydraulic units (two Oleo Type 710 – 1000mm recoverable stroke). Impact capacity 1120kJ.

FRICTION WHEEL STOPS

Friction wheel stops are generally situated at the end of the line in depots and parking areas for rolling stock where relatively low speeds are operated. These devices are fitted to the rail profile and engage with the rolling stock wheel. Friction shoes positioned behind the wheel stop are utilised to dissipate the impact energy in the same manner as the sliding friction end stops

FRICTION WHEEL STOP DESIGNS



- Contains one pair of friction shoes with an average breaking force of 50kN.
- Height from top of stop to top of rail is less than 150mm.

Examples for conditions and track occupied:

1) 8 CARS

- Type MCLD Depot or maintenance workshop
  - Train mass: 300 tonnes, Impacting speed: 5km/h, Installation length: 6.5m.
  - Train mass: 300 tonnes, Impacting speed: 3km/h, Installation length: 2.5m.

2) 6 CARS

- Type MCLD Depot or maintenance workshop
  - Train mass: 220 tonnes, Impacting speed: 5km/h, Installation length: 5m.
  - Train mass: 220 tonnes, Impacting speed: 3km/h, installation length: 2m.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ELEVATOR

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