



**BRITISH
STEEL**



Rail Handling Handbook

BUILDING STRONGER FUTURES



Handling rail from British Steel

Care and attention must be used when storing and transporting rail products. As their journey from point of manufacture to installation can be lengthy and complex, it is imperative that any movement of rail products is carefully planned and managed to protect the products' integrity and the safety of personnel.

This guide sets out the recommended handling procedures for all British Steel rails from short lengths to long welded rail and steel sleepers. For special cases, i.e. the transportation of special profiles, logistics experts at British Steel are available to offer advice on the most appropriate handling procedures to use.

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GENERAL PRECAUTIONS

The general principles for the handling of rail are set out in this section. More detailed information and recommendations may be found in the remaining sections of this handbook.



Protection of straightness

It is essential that special care is taken to avoid loss of straightness during all handling, stacking and transport operations. In particular you should:

- Avoid heavy static loading and sudden impact (or dynamic) loading
- Avoid single point slinging and ensure a minimum two-point-slinging. More slings should be used for longer rails as appropriate
- Ensure when lifting or moving rails that they are kept horizontal and straight. Avoid end droop and flange overlap
- Guard against localised point or line contact loading when stacking. Align rails uniformly, avoiding flange overlap
- Ensure that rails of the same length are stacked together on a firm level base providing uniform support
- Subsequent layers should be separated with consistently and uniformly placed spacers or dunnage in vertical alignment with the base supports, as per the recommendations in the stacking and stocking section
- All necessary precautions are taken to protect rail ends. Extra care should be exercised with longer rails
- In ships' holds rail stacks are secured against lateral and longitudinal movement by ample wedging, timbering, shoring, lashing and securing. Ship hatch sizes are critical for safe lifting control as well as the prevention of product damage
- Ensure strict adherence to transport company instructions on load location, clearances and load fastenings when transporting rail across multiple rail wagons

Avoiding surface damage

Surface notches of less than 0.5mm have been shown to be the cause of fracture in service. Insufficient care in handling and transport operations can easily lead to serious rail surface damage. To prevent rail surface damage we recommend that the following handling procedures and precautions should be followed:

- Minor or light scoring or abrasion of rails can be extremely dangerous. Avoid impact or abrasion of rails and rail bundles against structures, buildings, ships' hatches or wagons and vehicles
- Ensure accurate rail end alignment in each layer
- Avoid flange overlap
- The use of round-link chain slings is prohibited. Rails should be lifted with either electro-magnetic lifting devices or specialist lifting clamps, e.g. Camloks
- Where conventional slings are employed, the use of fabric (e.g. polypropylene) slings and sleeves are recommended. As an alternative, wire ropes can be used or flat link chains which are fitted with fabric or other protective sleeves.

It is important that any rail support, handling or clamping device and rail pinch rollers do not apply localised or point contact to the rail.

Coated rail should be lifted in the same way, but extra caution should be taken to prevent impact/dragging damage. It must be lifted and secured on all occasions using clamps or fabric slings.

Preventing metallurgical damage

The steel used in the manufacture of rails is highly thermally sensitive and metallurgical defects are likely if exposed to localised heating. During handling and transport operations every precaution should be used to prevent such damage taking place. It is therefore important to avoid:

- Heating, welding or flame cutting either on or adjacent to rails
- Any contact with electric arcs and metal splash
- Heavy abrasion

In cases where slings are used to handle larger bundles, the strapping of hardwood bearer battens to the underside of each bundle is highly recommended. The battens, placed at each slinging point, act as lifting pallets under which the slings should be positioned. This will ensure that the bundle remains flat during lifting, without any 'folding in'.



Protection from injurious substances

Slow and gradual rusting and corrosion is inevitable in any unprotected steel product. Rails are no exception, and this natural process is generally considered to be acceptable. However, rapid and acute localised corrosion can be very dangerous. Therefore it is essential in rail handling that:

- Contact with injurious substances is avoided
- Potentially prejudicial materials are not stowed near or above the rails
- Below deck storage is used for maritime transport, unless agreed with British Steel on charter of a vessel
- All holds between decks and hatch covers are clean and free from all such injurious substances
- When stored, stock is placed on well drained inert base material
- Long duration storage should be restricted to inland sites
- Safe working practices are carried out, especially in the vicinity of electrical conductors and wiring to avoid contact with rails
- All heating, welding and flame cutting on, or in the vicinity of rails during handling or transit operations is prohibited

Minimising danger to personnel

In addition to the statutory requirements of the relevant Health and Safety regulations and materials handling codes of practice, it is recommended that special attention be given to:

- The use of effective protective gloves and clothing to reduce the risk of skin abrasions and lacerations. Gloves will also mitigate against the effects of the extremes of temperature experienced when rails are exposed to either very cold or very hot climatic conditions
- The wearing of steel toe-capped protective footwear is recommended. Ensure safety helmets and high visibility clothing is worn for ease of identification and location of personnel by machine or crane operators
- Avoid standing under suspended loads
- Avoid sudden dropping or impact on rails
- The use of bundle straps to lift, sling or handle rails or steel sleepers is forbidden
- Precautions need to be taken for working at height



PRESENTATION AND PACKING

The proposed methods of transportation and handling facilities will, to some extent, dictate the choice of rail presentation and packaging. Standard packaging choices include:



Rails all head-up and loose

Offering the most economic and flexible handling, this form of presentation allows for considerable choice in the rail handling technique. This presentation method is recommended for most deliveries and for all rails over 20 metres.

The use of Camlok self actuating rail grip devices are highly recommended for the crane movement of head-up loose rails. Please note that other types of clamps are available.

Rails all head-up and strapped

This method may be used for short rail up to 20 metres.

Packs of an agreed weight or number of rails are fitted with wooden spacer blocks between the heads of adjacent rails. The bundles are then secured with tensioned strapping and clipped. The metal/nylon strapping must not be used for lifting or slinging bundles of rails.

Slings may be used to handle the strapped bundles but suitable rail grip devices, such as Camlok Multi-rail clamps are considered more suitable and are recommended.

Rail nesting and strapping

Bundles are formed with rails alternately head-up and head-down. The rails are usually packed two head-down, nesting in three head-up, and are bound with tensioned metal strapping and clipped. Nested rails must be strapped into bundles and must not be shipped loose.

It is recommended that this system is restricted to rails of up to 20 metres. Camloks or other multi rail clamps cannot be used to handle nested and strapped bundles and therefore suitable slings should be employed. Extra care is needed when opening nested bundles because of the risk of roll-over of head-down rails.

Bundles to customer requirements

British Steel can offer alternative bundling and handling arrangements to suit individual customer requirements, if required.

STACKING AND STOCKING

Base preparation

The stability and security of a stack is determined largely by the quality of the base preparation. The base must be level and flat, free from projections, and preferably built on concrete. If an earth base is to be used it should be well drained, uniformly compacted without any soft areas and be of inert material.

Base supports and hard wooden dunnage should be evenly spaced by a maximum of 3.5 metres along the rail length, and within one metre of the rail ends. Rails forming the bottom layer should be carefully aligned and care should be taken to avoid overlapping of rail flanges.

Precautions are also necessary when loading rail trucks or road transport, particularly where long rails occupy more than one vehicle. Depending upon the vehicle route, clearances between the outer rails in the stack and any vertical surface of retaining pins may be specified.

In such cases these prescribed clearances must be strictly observed, following local regulations enforced in the country at time of movement.

Subsequent layers

In the assembly of a stack or stockpile of rails these essential guidelines should be followed:

- Form stacks from rails of the same length where possible. Longer rails should not be placed on top of shorter ones
- Segregate rails according to specific criteria such as drilling and/or length of the rails.
- Avoid a leaning stack by placing rail ends (rails of the same length) in vertical alignment
- When dunnage is used do not cross layers. Keep the rails in a uniform lengthways direction
- Ensure the good vertical alignment of dunnage or spacers in the completed stack by placing them in identical positions above the base support
- Base supports should be made of hard material (hard wood/concrete or steel sleepers)
- Dimensional section of the spacers should be:
 - 80 x 80mm for rails packed in bundles in the nested position
 - 50 x 80mm minimum for rails head up, loose or packed in bundles
 - 50 x 100mm for rails to be delivered to USA/Canada

- Maximum height of stack is dependant on the rail section and ground conditions
- Wooden timber dunnage should be of a uniform and adequate thickness. Typically 100mm x 100mm cross section to guarantee stack stability and allow for sling removal without 'ripping-out'. The timber dunnage should comply with any local or special agricultural import regulations
- Each successive layer of rail should be of either a constant or decreasing width

Guidelines for exposed storage over a long period of time

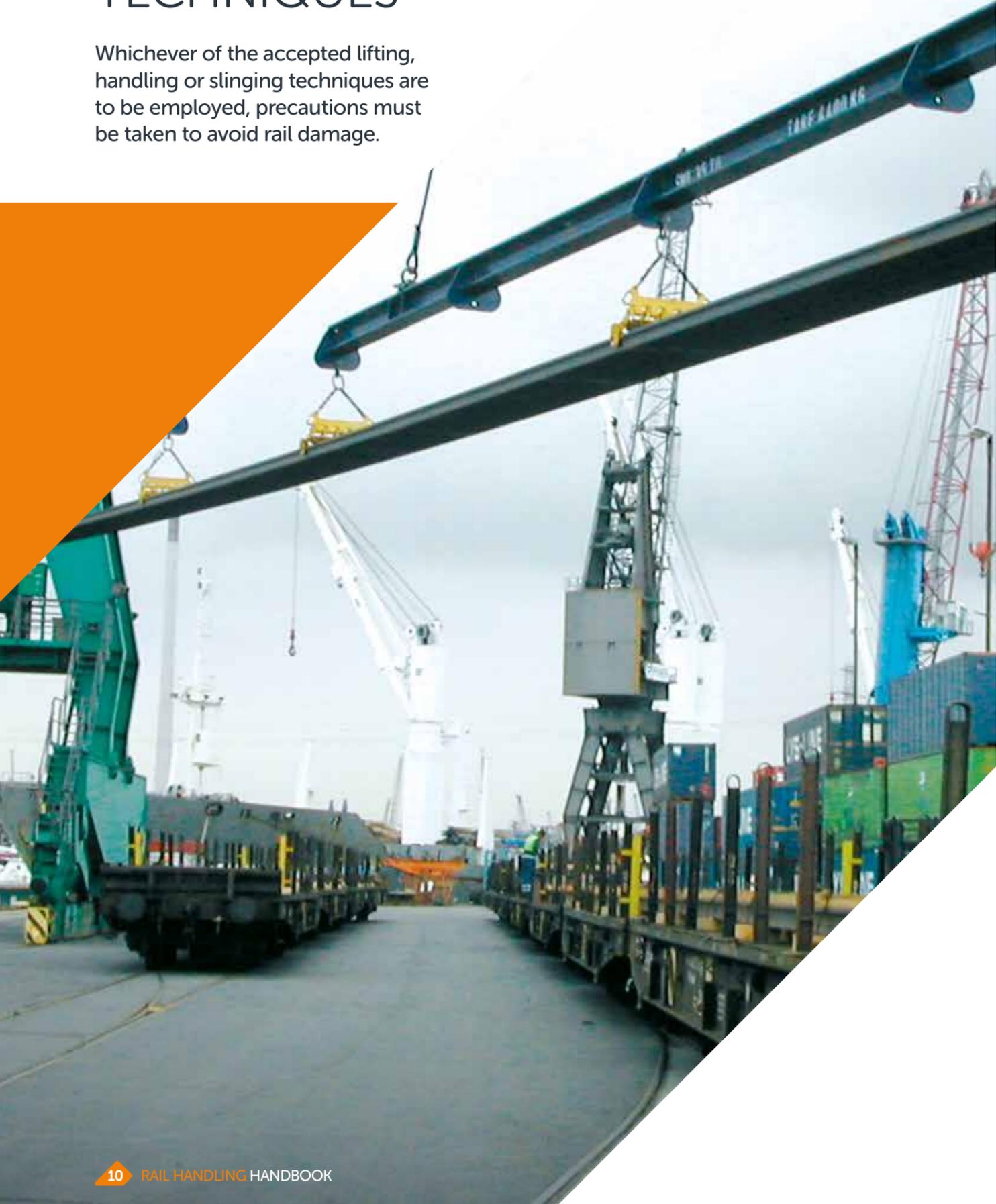
Rust generated over a long period of time could be damaging to the rail. To avoid this, the following guidelines should be followed. Please note this is strictly for rails stored over a long period of time.

- Space rails at least 50mm apart (between each foot)
- Space each layer of the rails 50mm – 100mm apart
- Stack all rails with a gentle slope between ends
- The stack should be aligned with the wind direction where possible to improve ventilation through the stack
- Rails should be checked every month to detect any rust occurrence
- Any heavy corrosion must be removed before rails are stacked
- If a linseed oil is used to protect against corrosion, the top surface of the stack should be protected at all times



HANDLING, LIFTING AND SLINGING TECHNIQUES

Whichever of the accepted lifting, handling or slinging techniques are to be employed, precautions must be taken to avoid rail damage.



Basic principles

The use of correct handling and slinging techniques is essential in minimising the risk of damage to rails. Both rail straightness and surface quality are particularly susceptible to damage during such operations.

1. Prohibit single point slinging. There is a high risk of bending and surface damage associated with single point slinging. This form of operation is also hazardous to personnel.
2. Use two (or more) point slinging. Two point slinging has proven to be satisfactory for the handling of most rail sections up to 18.3 metres (60ft) in length, and for heavy sections up to 24.4 metres (80ft). Three or four point slinging is recommended for longer rails.
3. Use lifting (spreader) beams fitted with slings, grips or other lifting devices of uniform length to ensure that rails remain horizontal and straight.
4. Avoid excess rail end overhang. The cantilever action of excessive rail end overhang beyond the outer lifting points can cause high stressing and permanent bending of the rails. The overhang beyond the outer lifting point should be less than one half the distance between lifting points.

Magnet lifting devices

Magnet lifting of rails is the preferred technique. Depending on rail length, two or more magnets should be suspended from a lifting spreader beam in accordance with the basic handling principles as outlined above. Magnet handling permits multi-rail handling and ensures that rails are maintained in a straight and horizontal position and are therefore less likely to incur surface damage. It is possible that, in some cases, local statutory regulation or engineering technical limitations may preclude the use of magnet handling.

Rail grip devices (Camloks)

Rail grip devices are suitable for most lifting operations providing that all the rails are in the head-up position. They cannot be used when rails are nested or with multi-layered bundles. Two or more grips are required, as appropriate, for a given length of lifting (spreader) beam. Care must be given to ensure the uniform engagement and disengagement of the load to avoid sudden release and impact shock on the rails.

We highly recommend the use of self-actuating rail grips in preference to scissor type grips. British Steel, in co-operation with Deeweld Limited, have developed the Camlok Multi-rail clamp as an efficient, productive and safe rail handling device. The use of the Camlok Multi-rail handling system effectively eliminates any risk of rail damage during handling. More information on this system can be found on pages 12-13 of this handbook.

Conventional slinging

Special care should be exercised to ensure that slings do not cause surface damage to the rails. Round link chains are not suitable for rail handling, however, hard wire cable slings can be used if they have protective sleeves fitted. Fabric strapping, such as polypropylene is highly recommended, with additional sleeves to protect the area where the sling is in contact with the rail flange tip. If, during handling operations, the landing of a sling of rails is likely to result in flange overlap on an existing stack of rails, the new lift should be put down a short distance from the existing stack. The newly landed rails may then be individually and accurately placed by manual levering. Sufficient timber dunnage (100mm x 100mm) should be employed to facilitate sling extraction without 'ripping out', which carries a high level of risk of rail surface damage and is dangerous to personnel.

Handling beyond crane coverage

For the movement of rails beyond crane coverage (in ships' holds or in isolated stockpiles), forklift trucks of suitable capacity are recommended. Forklift truck tines should be protected at all times; special care and attention should be given to ensure that they do not strike or scuff the rails, especially the underside of the foot; they should not exceed the height of the wooden spacers and they should be marked so that the bundle is slightly back from the edge of the tines.

In movement operations one forklift truck can be used for rails shorter than 12 metres; this depends on the rail section and the distance between each of the truck forks. Handling with one forklift truck should be discussed with a British Steel representative on every occasion. For rails up to a maximum of 25 metres in length, two forklift trucks should be used. For longer or coated rails the use of forklift trucks is strictly prohibited.

The ground or surface on which the trucks are to operate should be level and free from undulations. When forklift trucks are moving across a previously placed layer of rails, in a ship's hold for instance, it is highly recommended that they operate on a runway of plates or boards.



CAMLOK SYSTEM

The Camlok system offers:

- High speed handling of large stocks of rail
- Complete safety
- Non marking of rail heads

The Multi-rail clamp has been specifically developed to facilitate fast bulk transfer of rail sections from rail stacks to wagons or ships' holds. The bundling of rail is unnecessary as the clamps retain the rail rigidly in a flange-to-flange position, thus eliminating the necessity of levering rails into position when stowing or fastening down on wagons.

The clamps which are normally used in pairs are provided with automatic double safety locks to safeguard against the rail being released by shock loads. No marking or damage will occur to the rail head during lifting operations as parts in contact with running surface are rubber lined.

The clamps can be used with any number of rails up to the maximum and may be inclined up to 25 degrees in order to pass the rails through hatchways of insufficient length.

Camlok clamp capacity

Model	SWL	Max. No. of rails	Wt. each
MR3	5t	3	84kg
MR4	5t	4	108kg
MR5	5t	5	132kg
MR6	6t	6	156kg
MR7	7t	7	180kg
MR8	8t	8	204kg
MR10	10t	10	252kg
MR12	12t	12	300kg

N.B. These clamps are manufactured to suit one profile of rail only.

Correct application

All clamps must be certified for use with the particular profile to be lifted. All rails must be stacked on their base flanges with edges touching. A minimum of two clamps must be used. Three clamps are recommended on rail lengths above 20 metres in order to reduce the flexing of the rails.

The toes of the Camlok clamps must always be suspended facing towards each other with locking handles towards the rail ends. The recommended distance between the outer two clamps is 50% to 60% of the length of the rail when using two clamps and 65% to 75% when using three clamps.

Attaching clamps

Lower the clamp and guide each one so that the feet pass between the rail heads until the clamp rests upon the stops. Rotate the locking lever through 90° and the spring catch will be heard to 'snap' into position. Check that the lever is locked by attempting to return the lever to the unlocked position. If the correct locking position cannot be achieved, one or more of the rails will be found to be out of position and they should be correctly positioned and re-locked. Do not lift if there is any doubt that locking has occurred.

Rails may now be lifted, travelled, tilted (max. angle 25°) and lowered as required. Every care must be taken to avoid rail contact with fixed structures to prevent accidental release.



Releasing clamps

Ensure that rails will land on a flat surface (and will also not move after release) and lower until clamps rest on their stops. Lift spring operated safety catch and return the locking handle to the unlocked position.

When all clamps are fully unlocked, lift carefully to prevent accidental lifting of the rails by the edges of the feet.

Please refer to www.camlok.co.uk for the latest guidelines including automatic locking versions.

Maintenance/inspection procedure

Daily inspection

- Inspect all spring-operated locking pins for correct position
- Check overall operation of locking action
- Check all swivelling feet for excessive side movement
- Inspect rubber pads for security
- Inspect all welds for cracks

Monthly maintenance

- Grease all pivoting points regularly
- Pack pivot boxes supporting the swivelling feet with grease
- Inspect chains, shackles, lifting lugs and swivelling feet for excessive wear



LONG WELDED RAIL

Long lengths of rail require highly specialised handling and delivery operations. Transportation of rail in long lengths can be completed by British Steel.

British Steel will be pleased to give advice on the transportation requirements needed for safe delivery and discharge if required. Delivery will be by rail, utilising a special train, fully equipped with the equipment needed to handle long welded rails safely and effectively.



STEEL SLEEPERS

Steel sleepers are packed in nests of 10-15, forming a compact stack of 330 sleepers on a 40ft road trailer in comparison to a maximum of 85 concrete sleepers.

Each nest of sleepers is secured by steel strapping, which must not be used as a lifting medium, nor should the sleeper lugs be used as lifting points. Sleeper lugs may be used for lifting individual sleepers. Nests of sleepers must be handled by slinging or forklift truck.



SERVICES OFFERED BY BRITISH STEEL

British Steel has many years' experience in the transportation and handling of rails and sleepers.

There are several modes of transport utilised by the company:

Rail - A fleet of delivery wagons is available to transport long welded rails.

Road - British Steel can provide a comprehensive delivery package from the manufacturing plant to on-site discharge.

Sea - Ocean going vessels loading in several UK ports and the port of Antwerp. The following considerations are made in the selection of ocean-going vessels:

- Maximum of 25 years of age
- Registered at the highest class of a well reputed register
- Fully P and I (personal injury to or illness or loss of life of crew members), covered for the duration of the contracted voyage
- Preferably a box-shaped hold vessel, open hatch type
- Accepted by British Steel or a British Steel representative at a port of loading
- Inspected by a British Steel representative before loading (cleanliness / watertight / general condition)
- Loading plan to be approved by British Steel or British Steel representative
- No corrosive or hazardous product to be loaded with rails
- Lashing/securing of the rails to be agreed with the British Steel representative

British Steel's logistics services, include specific aspects of the handling, stocking and transportation of rails. If required, British Steel can provide a full transit project assessment, encompassing the whole shipping operation from the manufacturing works to the final destination.

The supply of Camlok Multi-rail clamp rail lifting equipment can also be arranged by British Steel.

For further information, assistance or advice on transport and logistics please contact the team at British Steel.



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