

MT/300

British Railways Board

Mechanical & Electrical Engineering Department

REQUIREMENTS

for

HANDLING, STORAGE AND

TRANSPORTATION

of

WHEELSETS





BRITISH RAILWAYS BOARD
DEPARTMENT OF MECHANICAL & ELECTRICAL ENGINEERING
MECHANICAL EQUIPMENT GROUP
BOGIE AND SUSPENSION SECTION

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TITLE REQUIREMENTS FOR HANDLING, STORAGE AND TRANSPORTATION OF WHEELSETS

SUMMARY

This document outlines those areas to which Managers of individual sites dealing with wheelsets and their components require to give attention in order to maintain wheelsets in good condition, and to comply with BS 5750. It applies equally to BR and to Contractors' sites.

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1. INTRODUCTION

- 1.1 This document outlines those areas to which Managers of individual sites dealing with wheelsets and their components require to give attention in order to maintain wheelsets in good condition, and to comply with BS 5750. It applies equally to BR and to Contractors' sites.
- 1.2 Definitions of the terms used in BS 5750 are given in order to clarify the requirements.
- 1.3 Some examples of procedures are given, with illustrations.
- 1.4 Managers are required to compile, and keep up to date by regular review, procedures and regulations for the sites for which they are responsible. They shall ensure that their staff adhere to these procedures and regulations.
- 1.5 These regulations are to take into account the facilities and equipment available at each site, in so far as these are compatible with the objective of maintaining wheelsets in good condition.
- 1.6 The BRB may, under Quality Assurance procedures, carry out audits to ensure that satisfactory procedures exist and are being implemented correctly.
- 1.7 By maintaining wheelsets in good condition, the incidence of damage to wheelsets will be reduced, with a corresponding reduction in costs. The incidence of in-service hot axleboxes, axle fractures and other failures will also be reduced. An increasing proportion of axle failures has been traceable to surface/protection damage during handling or to a lack of protection during wheelset storage.
- 1.8 The low weight and high performance of a modern railway vehicle requires that components are designed to higher stress levels and are therefore less tolerant to damage of any kind. Standards that may have been considered adequate in the past are no longer acceptable.

2. SCOPE

- 2.1 It is current BR policy that all suppliers, and BR itself, must comply with BS 5750 : Quality Systems, defining the system commonly referred to as Quality Assurance.

This document shall be applied as a necessary part in achieving compliance with BS 5750 in respect of the handling, storage and transportation of wheelsets and their components. It applies to all BR owned wheelsets, whether new, repaired or for repair, whether under direct BR control or under supply or repair contract or sub-contract.

- 2.2 In consideration of the various different local practices which currently exist, the different plant and equipment available, and the possible introduction of new procedures, this document does not specify mandatory means of achieving the objective of defect free material, but various areas are highlighted as requiring attention. Some examples of procedures are given with illustrations. These examples are not exhaustive, but are indicative of the general principles to be applied.

- 2.3 The Manager of each Depot, Store or other site dealing with wheelsets is required to produce, and keep up to date, procedures and regulations for dealing with wheelsets on the site, taking into account the activities carried out and the facilities available.

- 2.4 Personnel dealing with wheelsets should be made aware of the need to maintain wheelsets in good condition, particularly in respect of the condition of paint (or alternative protection) on the axle, and axlebox bearing and transmission component integrity. Dangers which may result from use of unsuitable procedures include:-

- a) A single small corrosion pit, following chipping of the paint, may initiate a crack which could ultimately lead to axle fracture.
- b) Axlebox bearings may seize, twisting the journal off the axle, following entry of small amounts of debris or extraneous liquids such as water.
- c) Transmissions may seize following entry of small amounts of debris or extraneous liquids such as water.
- d) Brake discs may crack shortly after first being used if, due to storage outside, and the consequent corrosion, the discs cannot expand freely.

3. DEFINITIONS

- 3.1 To clarify responsibilities and requirements, it is necessary to define certain terms particularly those used in the extract from BS 5750 (see Section 4) which is necessarily broad due to the need to cover different industries and business activities. These definitions are as below:-

3.2 'SUPPLIER'.

This covers the part of an organisation, eg. BR depot or store, contractors workshop, etc, whether within BR or under contract or sub-contract to BR, dealing with the product.

- 3.3 'MANAGER'. The person having responsibility for controlling and directing the supplier's activities relating to wheelsets.
- 3.4 'PRODUCT'. This covers wheelsets and any attached components not fitted to vehicles, whether new, repaired or for repair or for transfer to another vehicle. It covers any wheelsets being removed from, or fitted to a vehicle. It also covers wheelset components and any components fitted to wheelsets.
- 3.5 'HANDLING'. This covers means of moving the product within work sites or stores, and on or off transport used in transferring the product between sites.
- 3.6 'STORAGE'. Covers the storage of the product between different activities. The degree of security and environmental protection required will depend on the product stored, for example roller bearings require more stringent conditions than rough rolled tyres.
- 3.7 'PACKAGING'. This covers conventional packaging, as of roller bearings, etc, and the partial protection applied to prevent corrosion and damage of vulnerable parts of assembled wheelsets, such as bearings, gears, earth return brushes, etc.
- 3.8 'DELIVERY'. This shall be taken as the transportation of the product to another site for the next activity (or storage) to be carried out. For this purpose, final inspection and test shall include visual verification of the product on delivery and on removal from a vehicle.

4. REQUIREMENTS

BS 5750 Part 2, (1987) : Quality Systems Clause 4.14, specifies that:-

"4.14 HANDLING, STORAGE, PACKAGING AND DELIVERY

- 4.14.1 General. The supplier shall establish, document and maintain procedures for handling, storage, packaging and delivery of product.
- 4.14.2 Handling. The supplier shall provide methods of handling that prevent damage or deterioration.
- 4.14.3 Storage. The supplier shall provide secure storage areas or stock rooms to prevent damage or deterioration of product, pending use or delivery. Appropriate methods for authorising receipt and the despatch to and from such areas shall be stipulated. In order to detect deterioration, the condition of product in stock shall be assessed at appropriate intervals.
- 4.14.4 Packaging. The supplier shall control packing, preservation and marking processes (including materials used) to the extent necessary to ensure conformance to specified requirements and shall identify, preserve and segregate all product from the time of receipt until the supplier's responsibility ceases.
- 4.14.5 Delivery. The supplier shall arrange for the protection of the quality of product after final inspection and test. Where contractually specified, this protection shall be extended to include delivery to destination."

5. COMMENTARY

5.1 BS 5750 Part 2 Clause 4.14.1: General

It is required that each supplier, through the appropriate manager, shall devise and document procedures for handling, storage, packaging and delivery of product. Work instructions, backed where necessary by appropriate training, shall be issued to the staff whose duties may involve these activities. Regular review of the procedures is required together with effective means of communication from shop floor to management and vice-versa in order to demonstrate effective maintenance of the system. Records shall be kept for all reviews of procedure and corrective actions relating of procedures and product.

5.2 BS 5750 Part 2 Clause 4.14.2: Handling.

5.2.1 It is required that the product is handled with the appropriate degree of care in order to ensure conformity with specification.

5.2.2 Examples - which should not harm product (see also Figures 1-8).

Roller bearings, in crates or heavy duty cartons in covered workshops or stores, mounted on pallets and handled by fork-lift truck.

Individually wrapped bearings handled manually - hands and clothing to be free of grit or other potentially damaging material.

Finish machined wheels, wheel centres, gearwheels, tyres, brake discs, axleboxes, traction motor suspension tubes, etc, handled using non-damaging fibre slings, or hooks with rounded-off edges and which bear only on non-critical areas, such as the inside of the wheel rims.

Axles handled by non-damaging fibre slings, or hooks attached to temporary lifting attachments fitted on the axle ends.

Handling of complete wheelsets by non-damaging fibre slings round the journal shoulders or the axleboxes, or by hooks or clamps with rounded corners locating under the wheel rim. Handling involving axle body contact by means which have been shown to be consistently capable of avoiding damage to the product and its protective coatings.

Rough rolled tyres handled by fork lift truck or chain slings etc.

5.2.3 Examples - potentially harmful to product. (see also Figures 9 & 10).

Handling (other than of rough rolled tyres) with lift truck forks, chain slings, or other metallic lifting devices in direct contact with the product.

Handling of part finished products (eg. rough forged axles) by magnetic hoist, leaving residual magnetism which may prove detrimental to axlebox or other bearings on the completed wheelset.

Loading or unloading of finished or part finished parts such as bearings, axles, transmission components, etc, in the open.

5.3 BS 5750 Part 2 Clause 4.14.3: Storage

5.3.1 This requires the provision of designated store areas or rooms. The degree of security, and protection against weather and/or dust and dirt, shall be appropriate to the product being stored. Access to the product shall be controlled to the degree necessary to prevent unauthorised use, or removal of parts. Regular intervals shall be stipulated for the inspection of stock to determine its condition, and the intervals shall take into account the product, the degree of corrosion protection and packaging applied, and the conditions prevailing in the store.

5.3.2 Examples - which should not harm product (see also Figures 11 & 12).

Storage, with appropriate protection, in a clean and weatherproof store, in conditions regulated to prevent formation of condensation, of the following finished or part-finished product:-

- a) Wrapped bearings
- b) Axles
- c) Completed wheelsets (including stress relieving grooves & component overhang on axleseats)
- d) Transmission gears and other similar components
- e) Earth return systems
- f) Brake discs
- g) Axleboxes

Indoor storage of bearings for limited periods (say 14 days) in controlled conditions with a single wrapper containing anti-corrosion materials. Longer term storage in such conditions, if packed and protected in a similar manner to that used by the original manufacturer.

Storage for a limited period, (defined in local work instructions, see 5.1) out of doors. Appropriate examination of :-

- i) Wheelsets completed to specification without any vulnerable exposed parts (suspension tubes, transmission components, bearings, brake discs, etc.)
- ii) Monobloc wheels, or wheel centres, in near-vertical position, with corrosion protection adequate for the storage period.
- iii) Brake discs with corrosion protection applied.
- iv) Unmachined axlebox castings.
- v) Rough rolled tyres, axle forgings, etc.

Wheelsets stored in line, or, if staggered, with chocks arranged such that bearings, axles, or other vulnerable parts cannot be damaged by contact with other wheelsets.

Axles stored on timber baulks, shaped to prevent rolling and contacting of adjacent axles.

Protection of all product from rainwater, dirt or other debris.

Rotation of stock so as to minimise storage time for any individual item.

Regular inspection of stock for deterioration at intervals dependent on the vulnerability of the stock and the storage conditions, say, weekly for axles, monthly for finished and painted wheelsets, three monthly for rough rolled tyres. Corrective actions taken in accordance with the procedures in force (see 5.1), records of inspections, and corrective actions taken, retained.

5.3.3 Examples - potentially harmful to product (see also Figures 13,14 & 15).

Storage outside, unprotected against weather and/or dust and dirt, of the following finished or part finished product:-

- a) Wheelsets
- b) Machined axles, wheels, wheel centres or tyres.
- c) Traction motor suspension tubes.
- d) Traction gears or other transmission components.
- e) Bearings.
- f) Brake discs.
- g) Axleboxes

Extended storage outside, without weather protection, of rough rolled tyres, wheels, wheel centres or rough forged axles.

Storage of bearings, loose or fitted to wheelsets, inside, but without environmental protection for periods longer than necessary for work to be carried out - say a single shift.

Storage of any product on soft ground.

Storage of machined product on sharp-cornered metallic supports which could damage product.

Storage of any product in a manner which allows rainwater or dirt, etc, to be retained, or in a manner which exposes the product to rainwater or dirt.

Stacking wheelsets one on top of another.

Stacking of any finished or semi-finished product with parts (other than wheel treads) of adjacent items in contact.

Failure to rotate stock, leading to extended storage time for individual items.

Lack of regular inspections of product and/or failure to take corrective actions to protect product.

The attachment of labels, etc, to the axle, in a manner which may damage the protective coating of the axle.

5.4 BS 5750 Part 2 Clause 4.14.4: Packaging.

- 5.4.1 This requires the provision of packaging sufficient to protect the product to the degree necessary to ensure delivery to the point of installation of the product in the 'as new' or 'as overhauled' condition, complying with the appropriate specifications. In the case of the product removed from vehicles for store, re-use or repair, the packaging shall provide protection against any further deterioration. It also requires adequate identification, which may, in the case of a designated product line be no more than presence of the product in a designated area. In other cases, it may require unique identification, including details of any special sizes (eg. wheel and journal diameter, axlebox liner sizes, etc). In the case of manufacture and repair activities, BR publication MT 240 applies, covering the markings on wheels, wheel centres, tyres and axles.

5.4.2 Examples - which should not harm product (see also Figure 16).

Protection of journals, bearings, gears, etc, by soft anti-corrosive tape, with an outer wrapper, or other temporary protective coatings to prevent corrosion, and mechanical damage from impact.
Protective coatings checked for compatibility with any lubricants which may be used on assembly and/or installation.

Double wrapping of bearings, the inner wrapper incorporating corrosion inhibiting material, the outer wrapper being sufficiently strong to give protection against mechanical damage.

Full weather protection of bearings on assembled or partly assembled wheelsets, to take account of the possibility that some types of seals may not be fully effective until after initial service running.

Appropriate protection against entry of dirt, rainwater, or other foreign matter, as for example by the provision and use of temporary weatherproof plugs for use in traction motor suspension tubes having openings (eg. for earth return brushes).

Support frames to restrain the movement of, for example, drive systems, whenever these may be required for particular wheelset types.

Appropriate protection of expansion mountings and braking faces on brake discs.

5.4.3 Examples - potentially harmful to product (see also Figures 17).

Inadequate protection against corrosion and/or mechanical damage of:-

- a) Wheelsets
- b) Machined axles, wheels, wheel centres or tyres.
- c) Traction motor suspension tubes.
- d) Traction gears or other transmission components.
- e) Bearings.
- f) Brake discs.
- g) Axleboxes.

Failure to close all openings in transmission systems, bearings, etc, potentially allowing entry of dirt or rainwater.

5.5 BS 5750 Part 2 Clause 4.14.5: Delivery

5.5.1 This states in effect, that the supplier's responsibility for preservation of the product continues until delivery. Delivery, final inspection and test shall be as defined in 3.8.

5.5.2 Examples - which should not harm product (see also Figure 18).

Use of secure chocks, fibre webbing and ratchet tensioner, to restrain movement of wheelsets being transported.

Components transported secured on pallets, with adequate separation of adjacent items.

Use of covered transport for components requiring it, eg. bearings, gears, and other finish machined components.

Use of tarpaulins to protect wheelsets, and components such as axles.

Use of open transport for rough rolled tyres, or other products requiring significant machining all over.

5.5.3 Examples - potentially harmful to product (see also Figure 19).

Use of open transport, even for a short journey, for any product having unprotected bearings, brake discs or transmission components.

Use of open transport for unprotected product having finish machined parts.

Use of chain or wire rope for securement of wheelsets.

Failure to provide adequate and secure chocks for wheelsets, wheels or wheel centres.

Bearings (or similar products) carried on open transport, even if covered by a tarpaulin.

Wheelsets stacked one on top of another, or in contact with one another during transport.

SHOULD NOT HARM PRODUCT

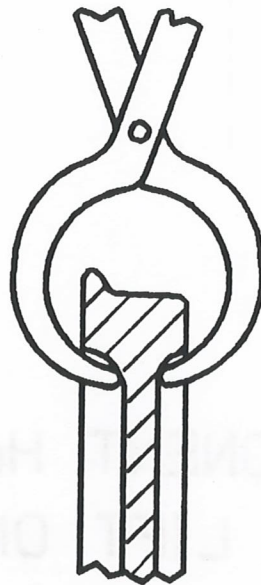
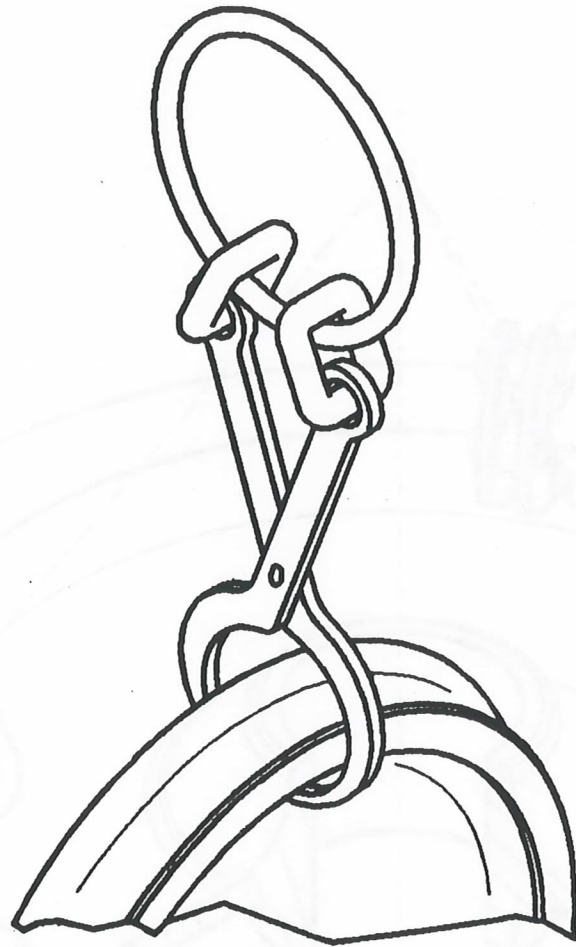


FIG.1 - COMPONENT HANDLING
SCISSORS CLAMP ON WHEEL

SHOULD NOT HARM PRODUCT

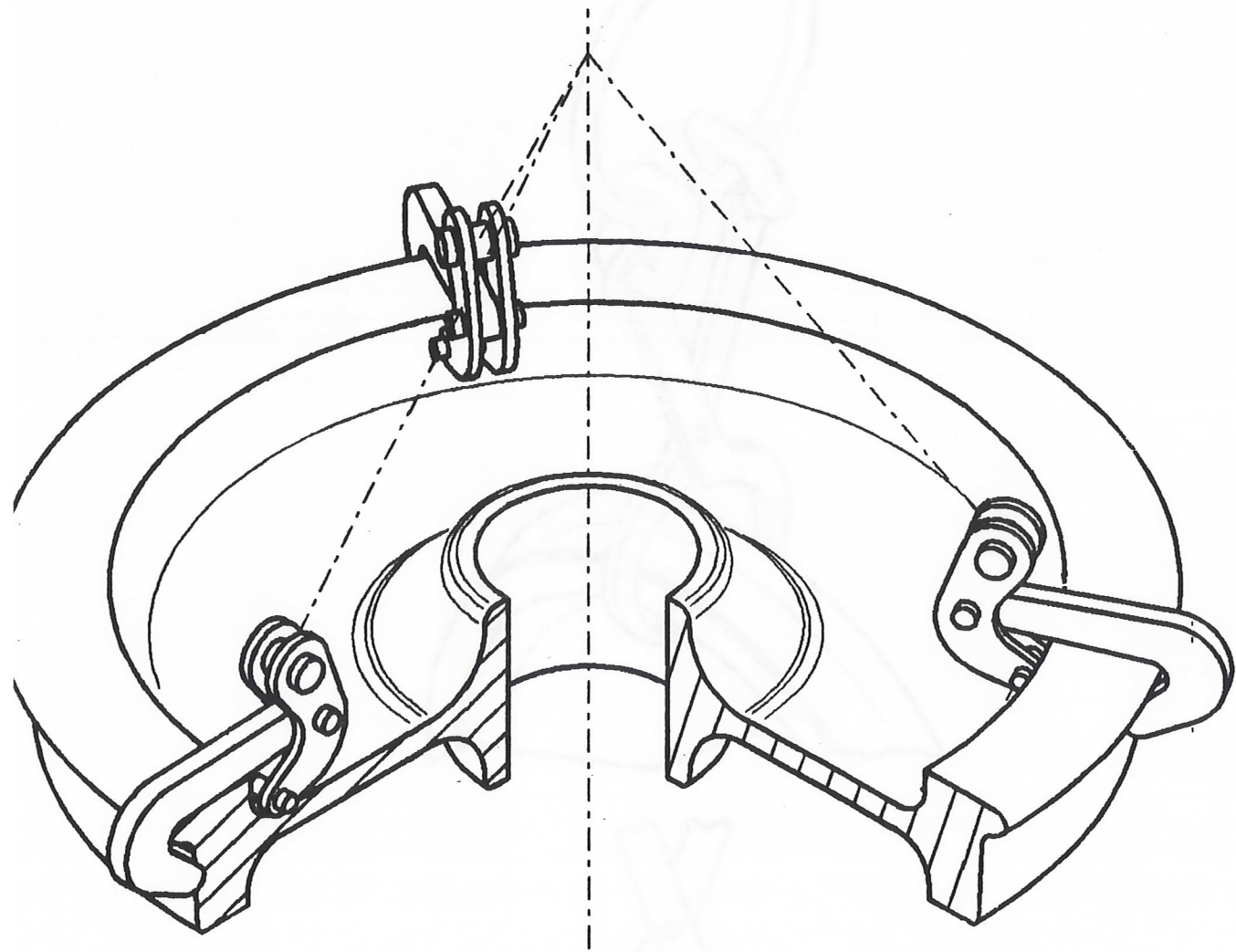


FIG.2 - COMPONENT HANDLING
THREE POINT LIFT ON WHEEL

SHOULD NOT HARM PRODUCT

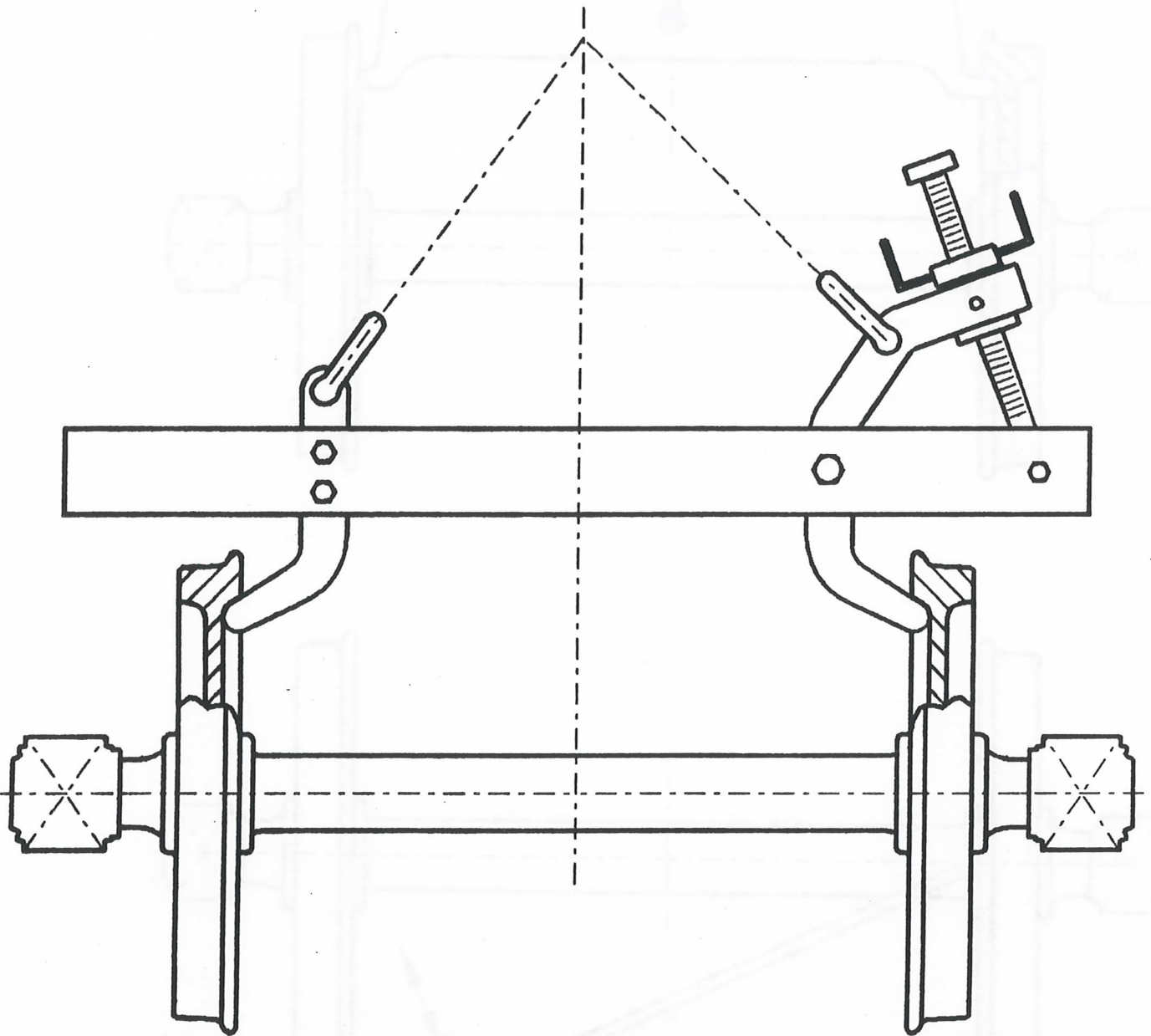


FIG.3 - WHEELSET HANDLING
BEAM PRINCIPLE

SHOULD NOT HARM PRODUCT

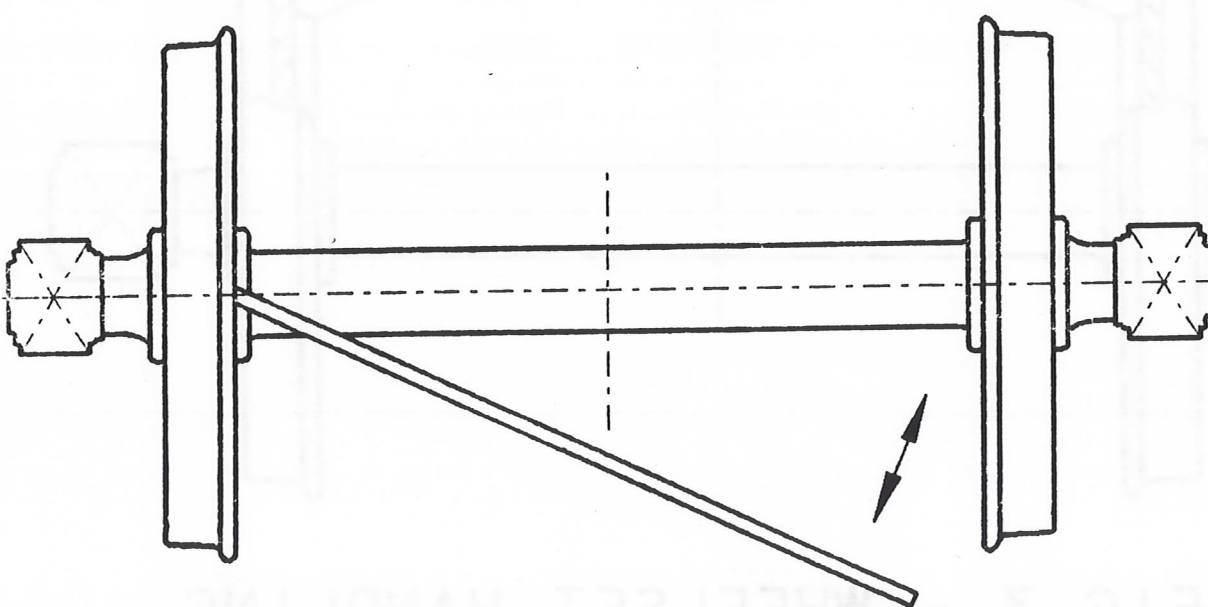
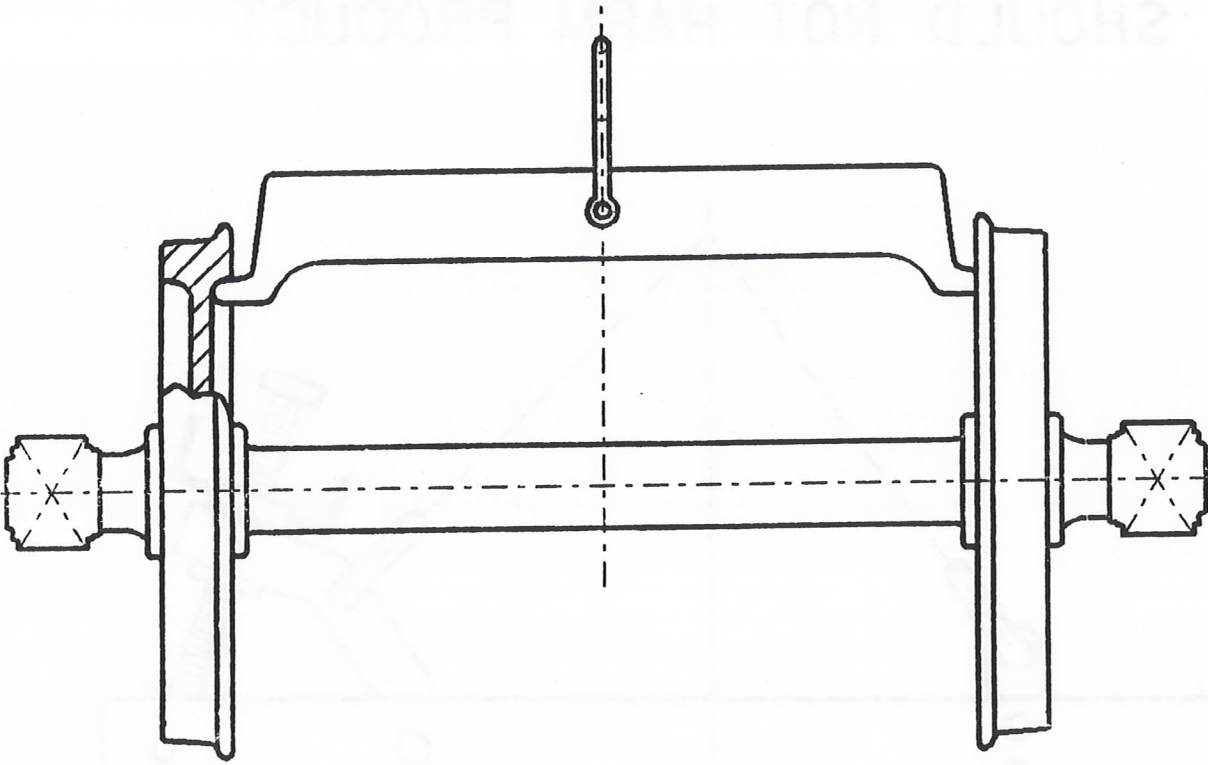


FIG.4 - WHEELSET HANDLING BEAM PRINCIPLE

SHOULD NOT HARM PRODUCT

2 X FIBRE SLINGS
AS ILLUSTRATED OR
USED IN CONJUNCTION
WITH LIFTING BEAM.

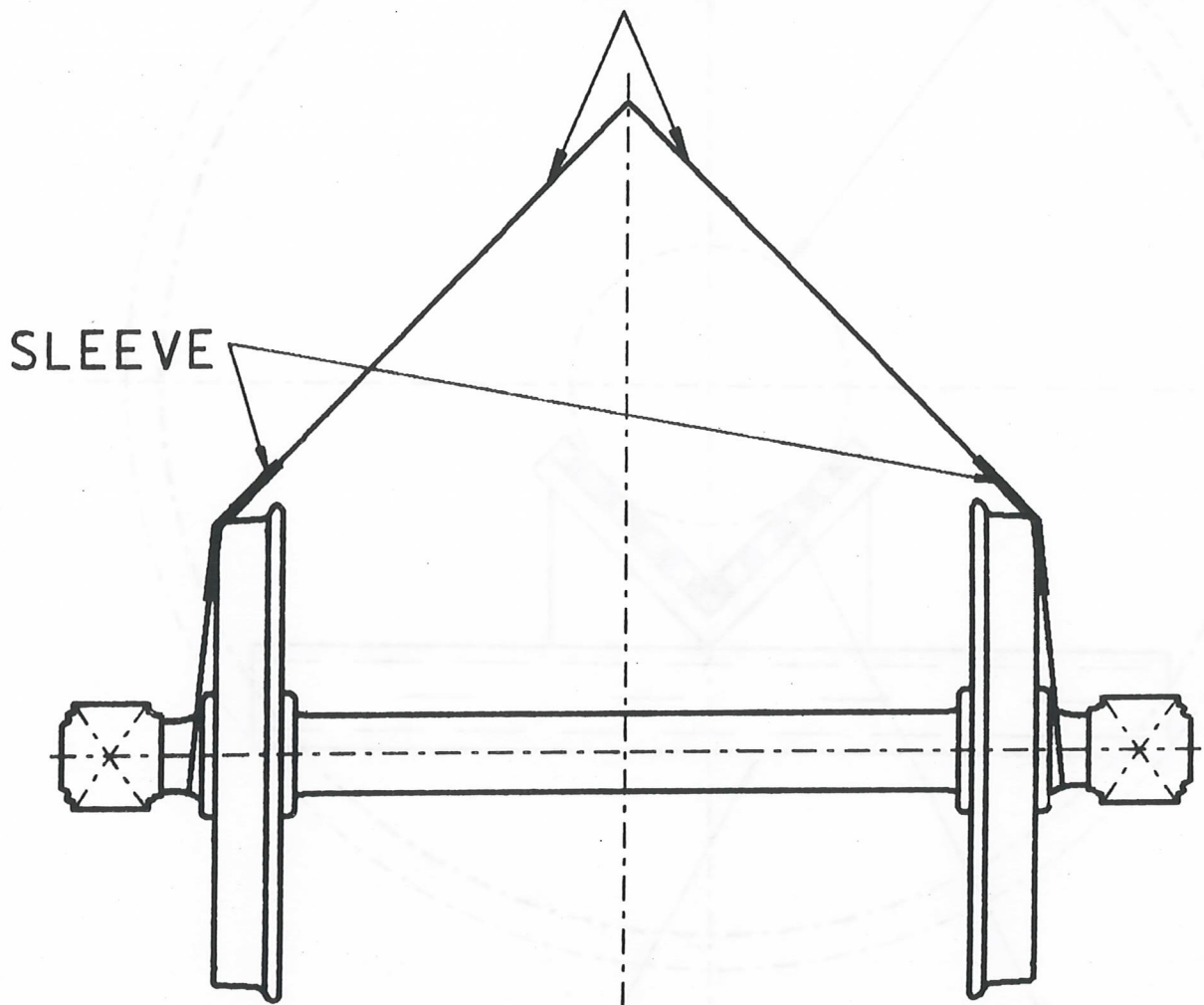


FIG.5 - WHEELSET HANDLING
USE OF SLINGS

SHOULD NOT HARM PRODUCT

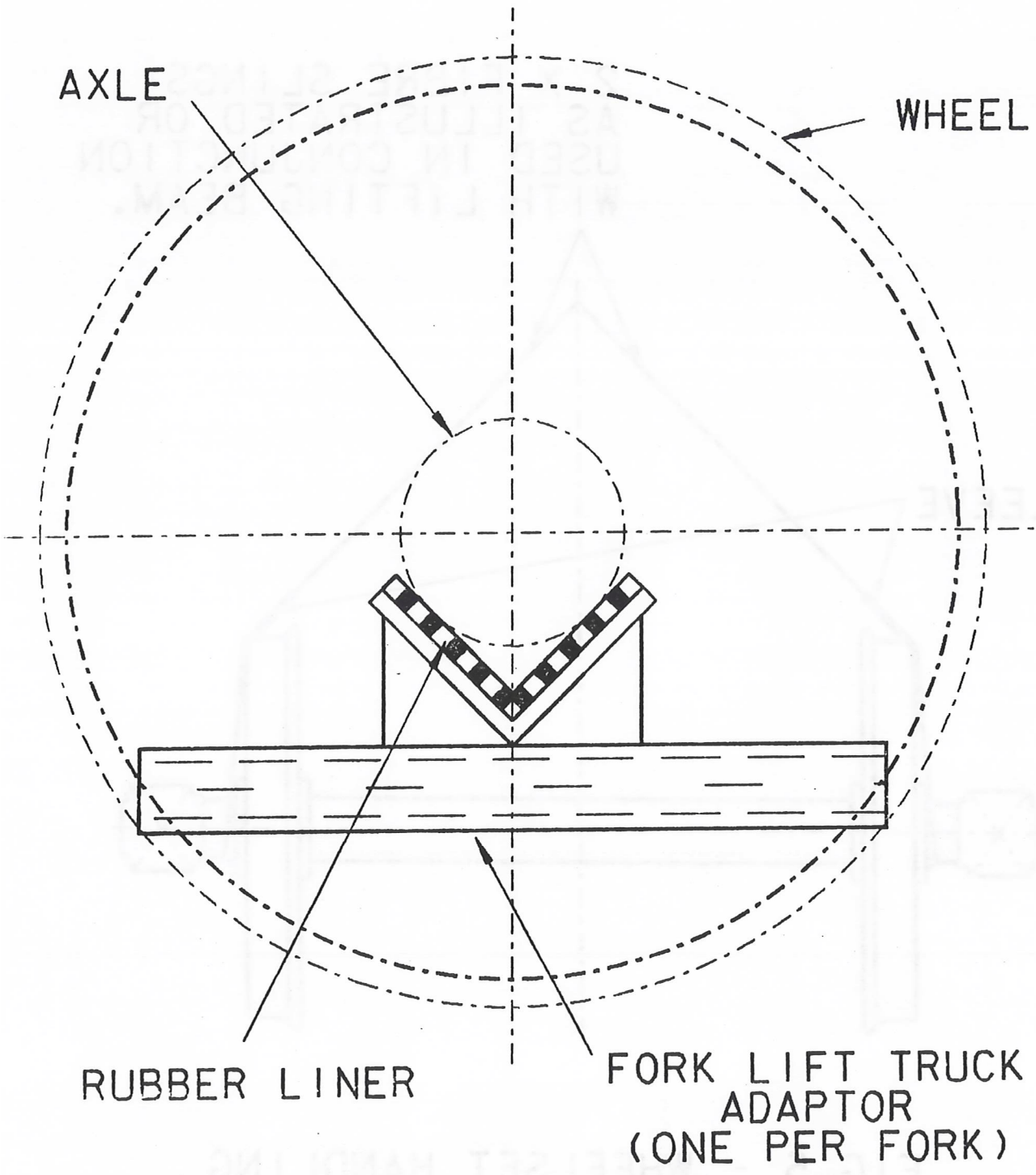
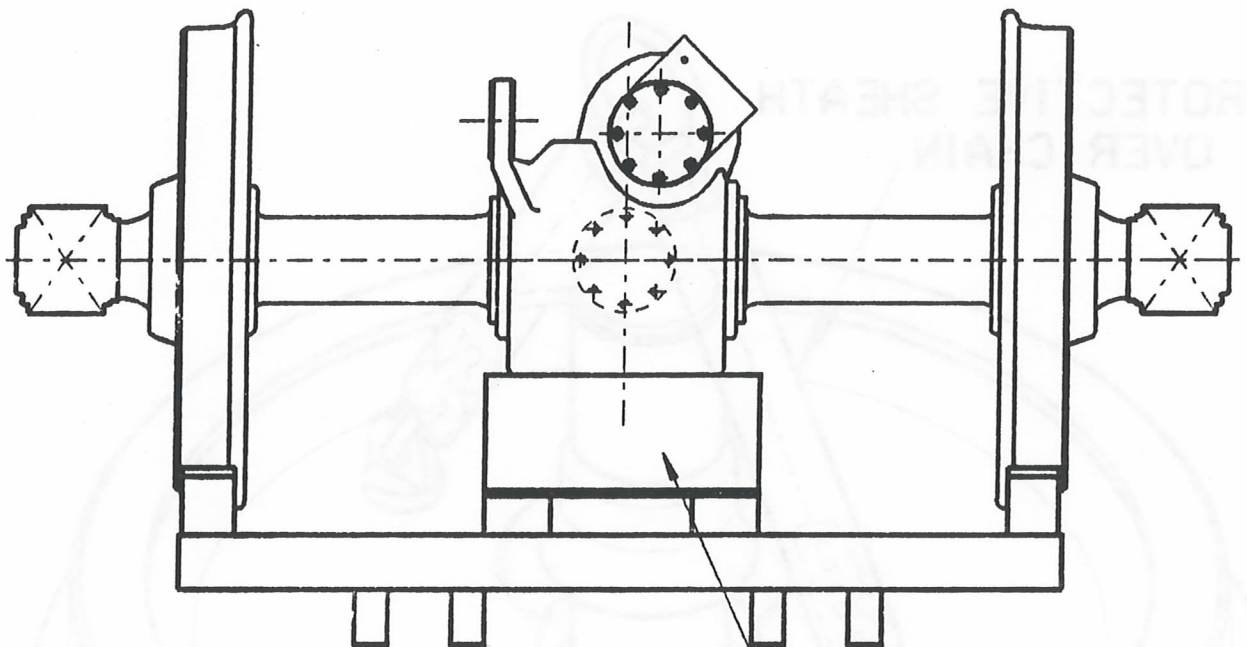
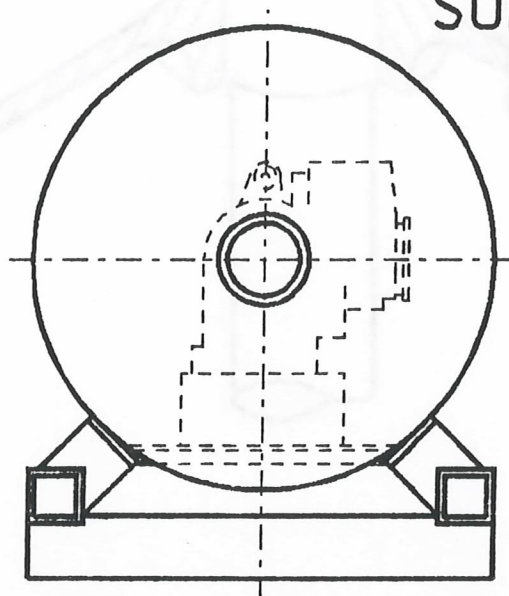


FIG.6 - WHEELSET HANDLING
FORK LIFT TRUCK

SHOULD NOT HARM PRODUCT



SUPPORT



SIDE ELEVATION

FIG.7 - WHEELSET HANDLING
USE OF CRADLE

SHOULD NOT HARM PRODUCT

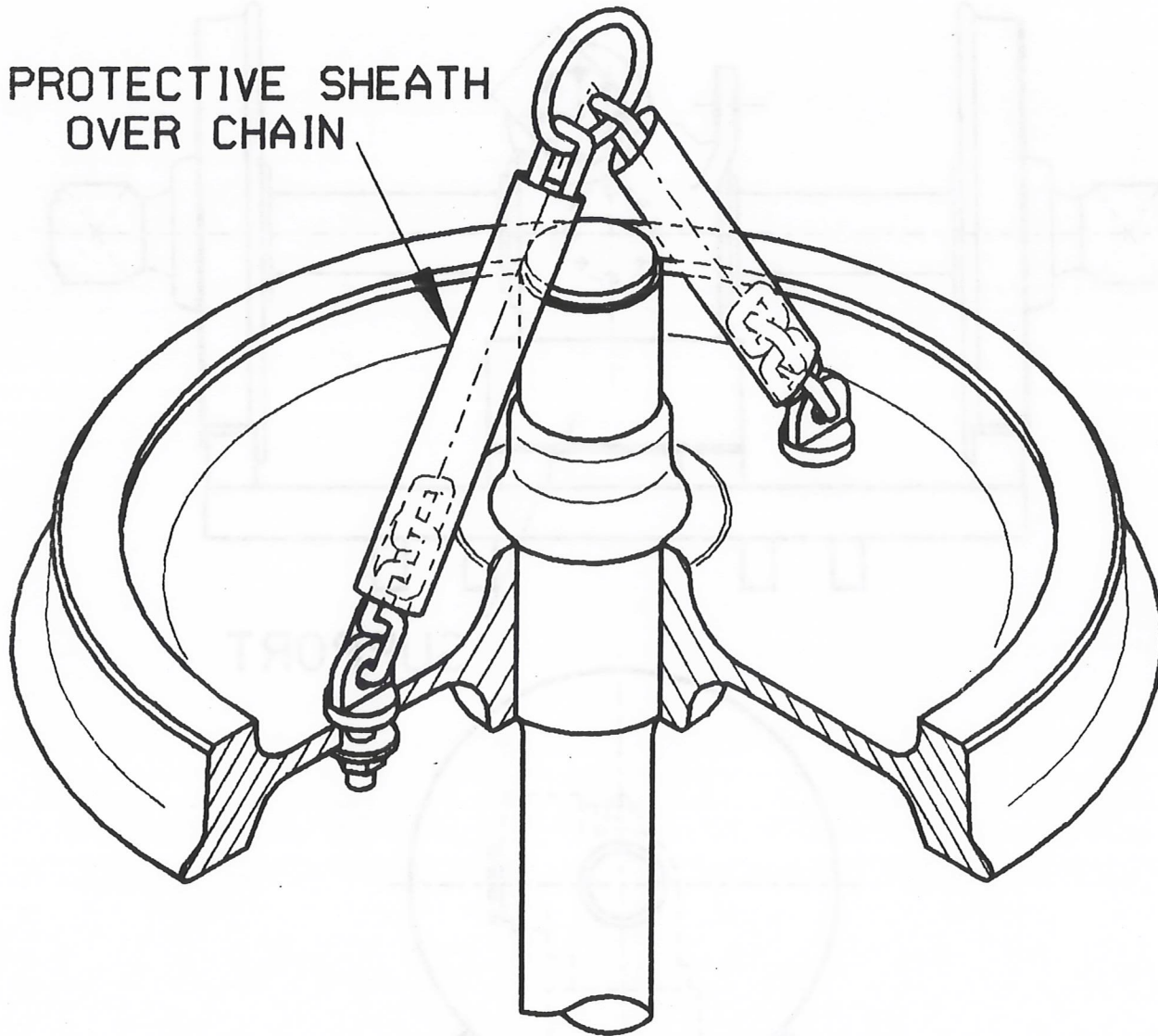


FIG.8 - WHEELSET HANDLING
VERTICAL PLANE

POTENTIALLY HARMFUL TO PRODUCT

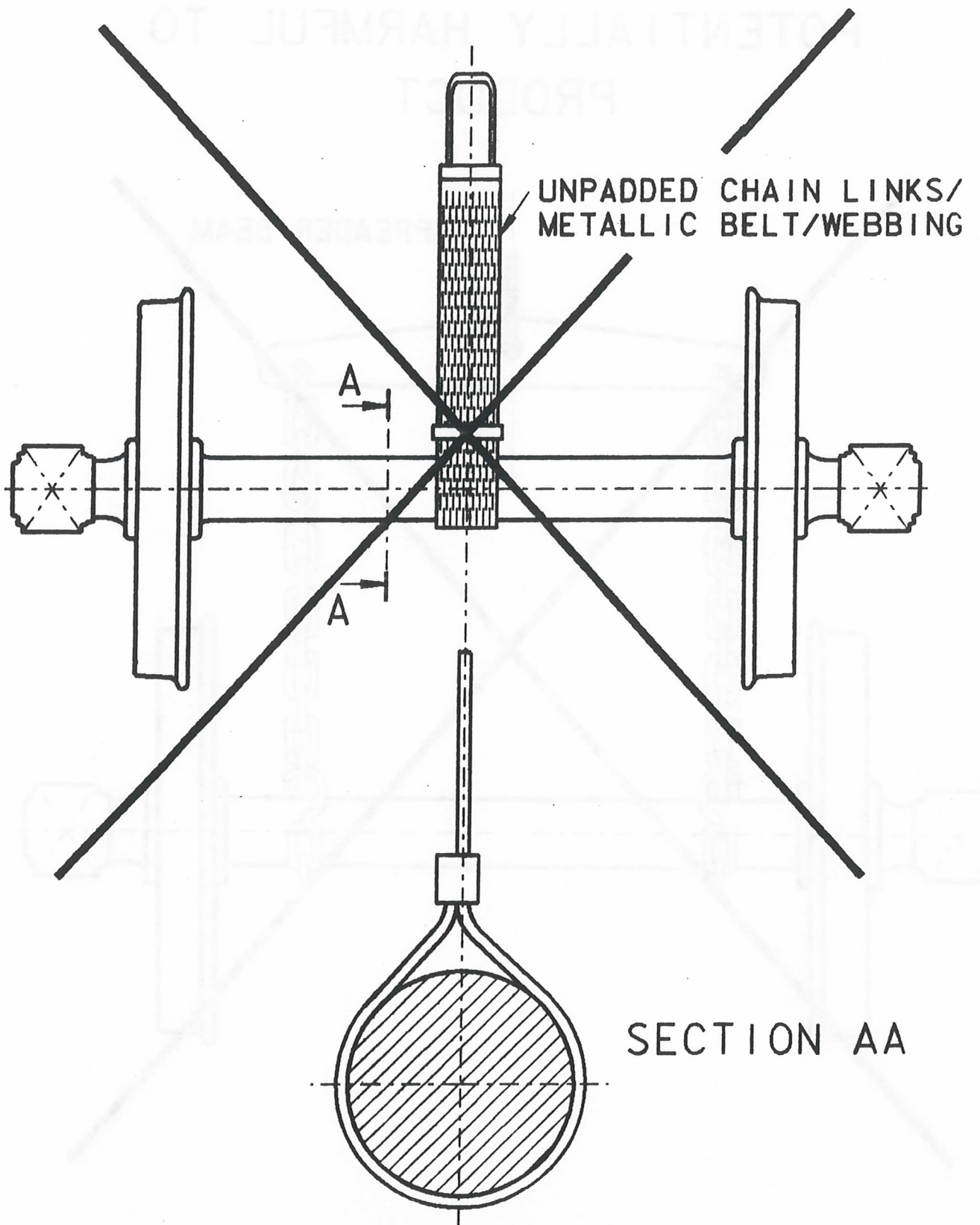


FIG.9 - WHEELSET HANDLING
USE OF METALLIC WEBBING

POTENTIALLY HARMFUL TO
PRODUCT

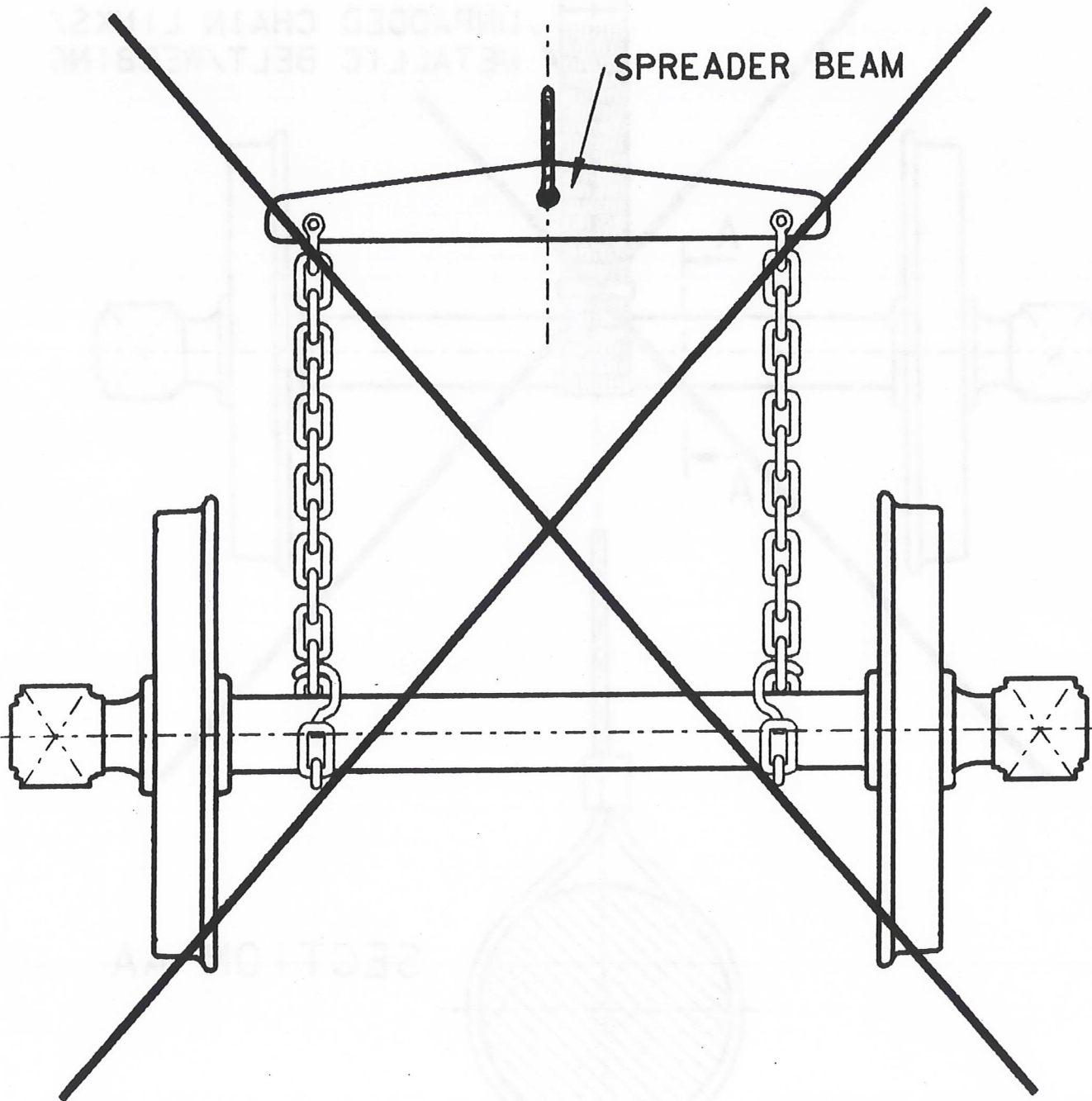
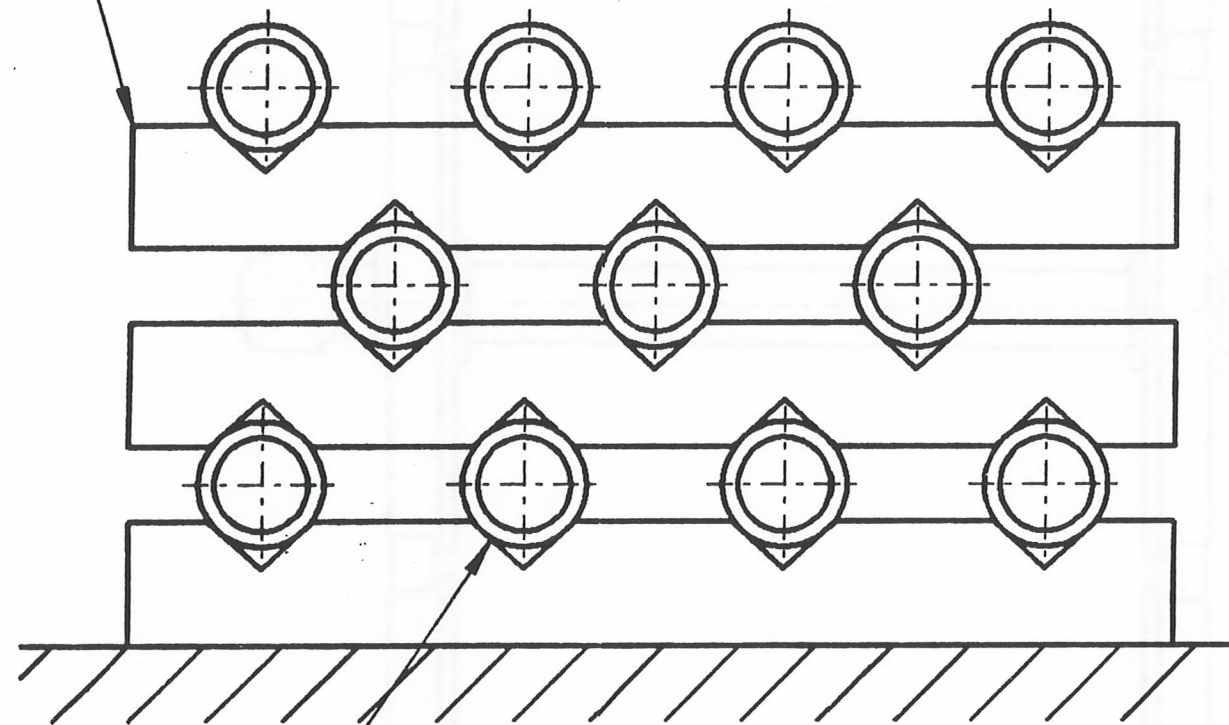


FIG.10 - WHEELSET HANDLING
USE OF CHAINS

SHOULD NOT HARM PRODUCT

BAULKS OF TIMBER OR OTHER
NON-METALLIC MATERIAL. PLACED
ON HARD STANDING FOR STORAGE,
ON PALLET FOR TRANSPORT.



AXLES

FIG.11 - AXLE STORAGE
USE OF CRADLE

SHOULD NOT HARM PRODUCT

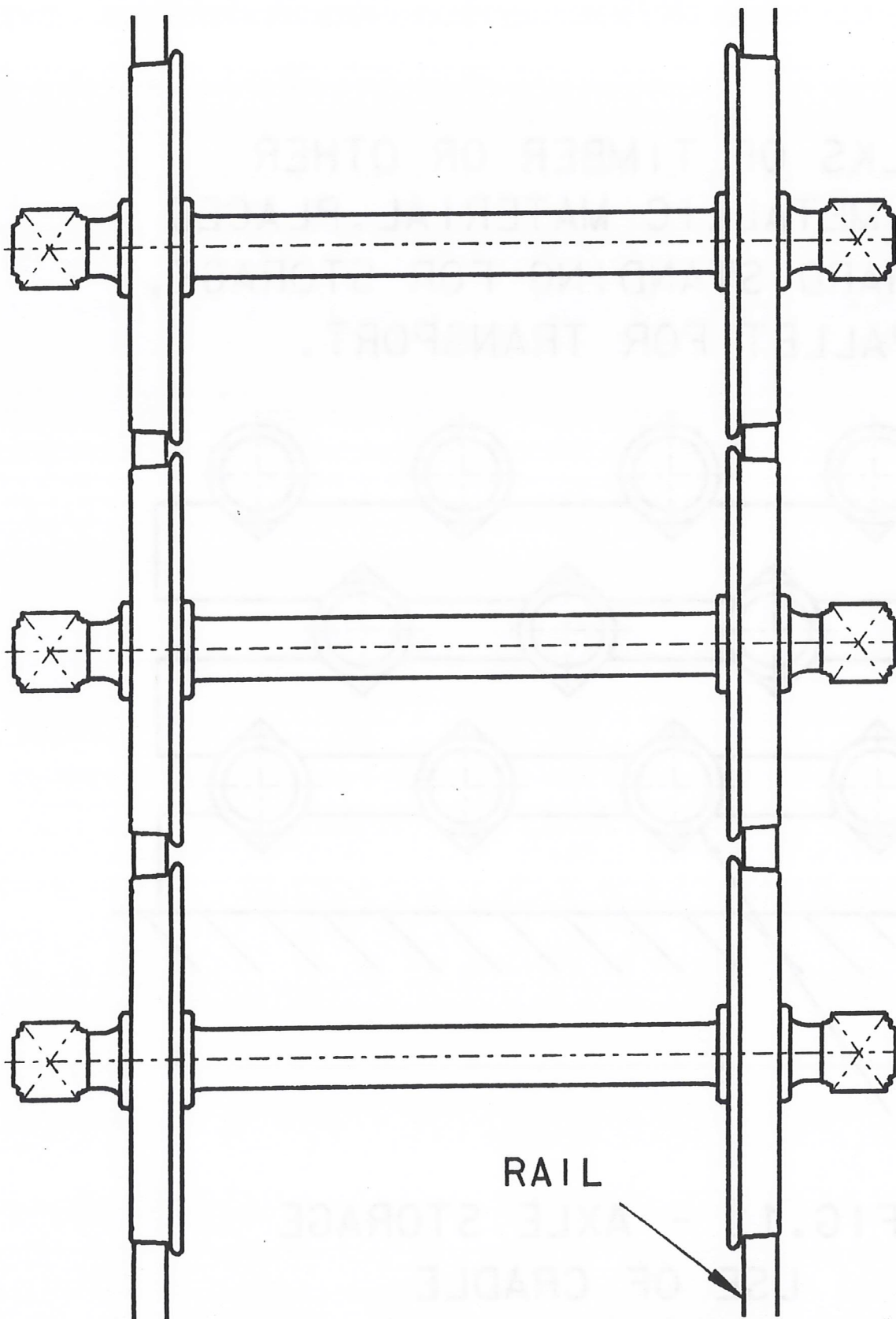
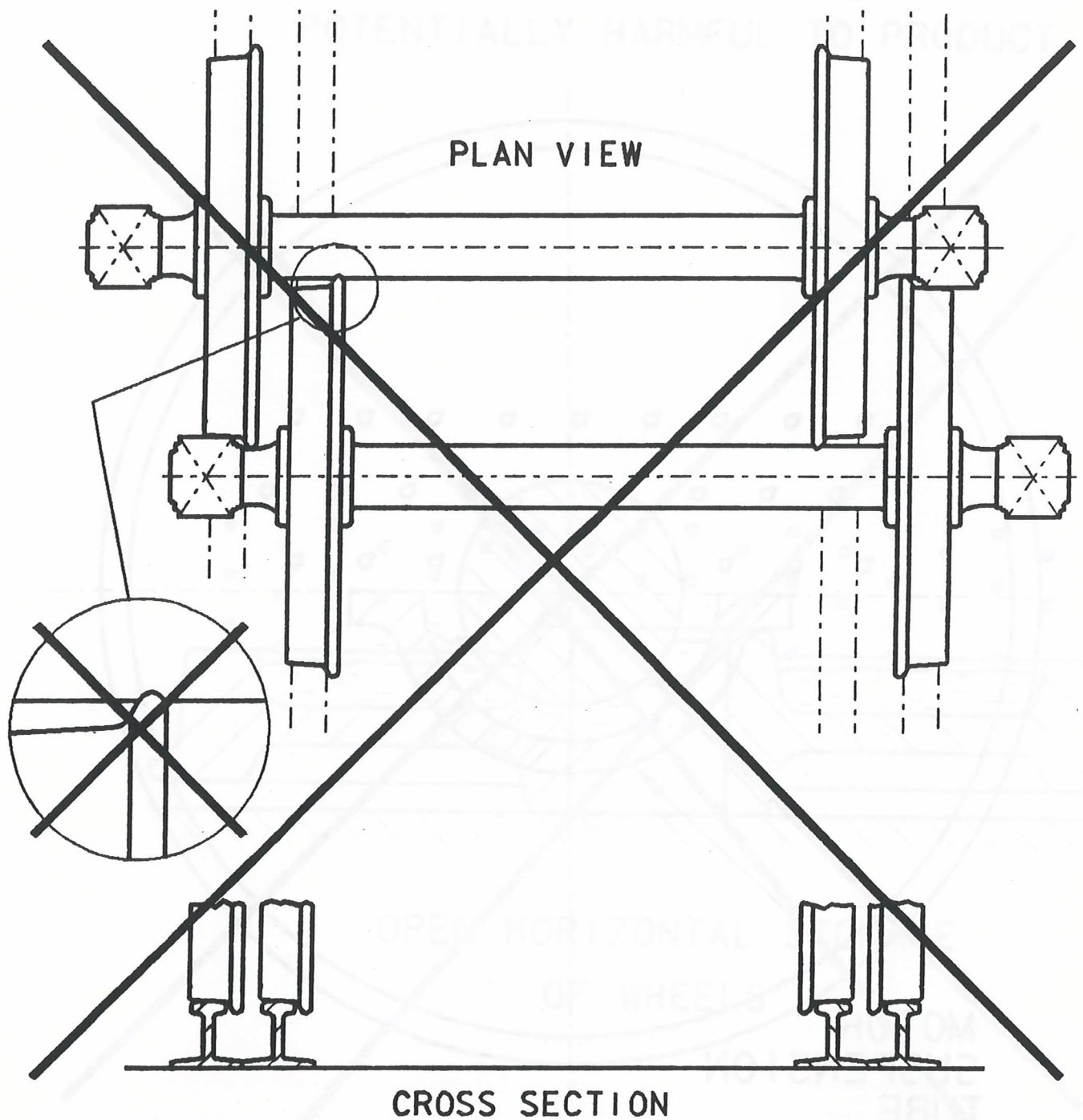


FIG.12 - WHEELSET STORAGE
NON STAGGERED ORIENTATION

POTENTIALLY HARMFUL TO PRODUCT



NOTE ABOVE ILLUSTRATES WHEEL FOUL BETWEEN FLANGE AND AXLE BODY/JOURNAL SHOULDER/JOURNAL BEARING/AXLEBOX/GEARWHEEL/AXLE MOUNTED DISC OR OTHER AXLE MOUNTED COMPONENTS.

FIG.13 - WHEELSET STORAGE STAGGERED ORIENTATION

SHOULD NOT HARM PRODUCT

SOFT ANTI-CORROSION
TAPE

PLAIN JOURNAL

MECHANICAL PROTECTION
(PLASTIC/TIMBER ETC)

ROLLER BEARING

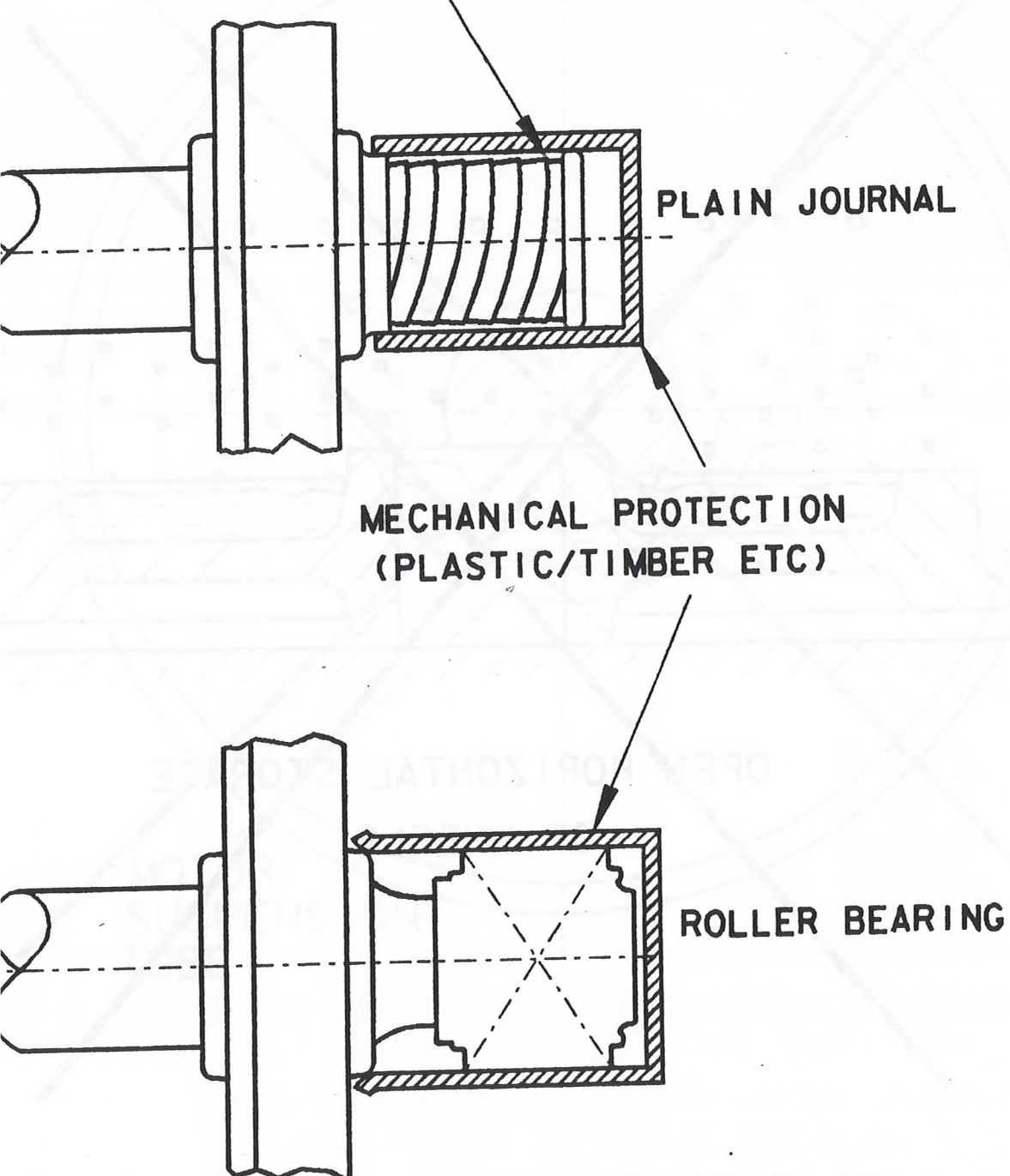


FIG.16 - WHEELSET PACKAGING
AIN JOURNAL & ROLLER BEARING PROTECTION

POTENTIALLY HARMFUL TO PRODUCT

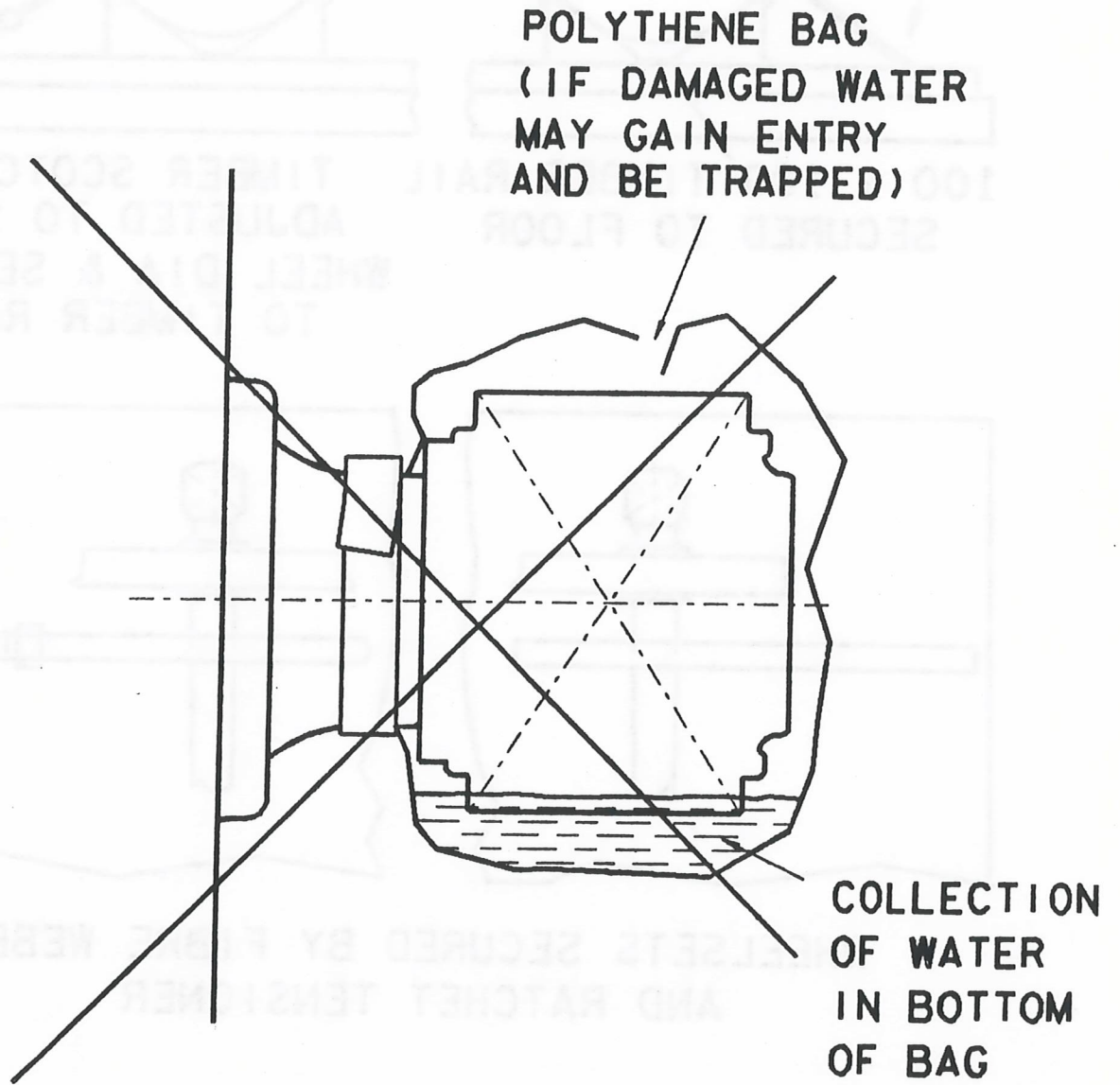
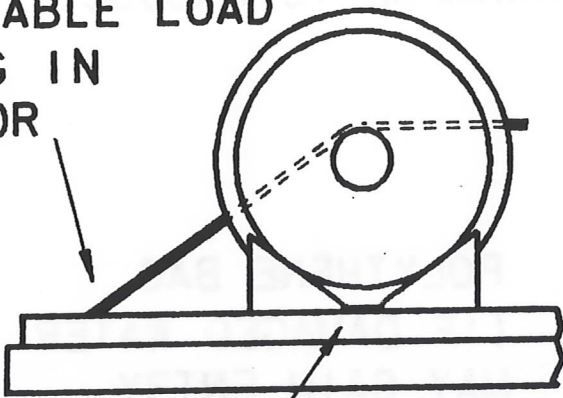


FIG.17 - WHEELSET PACKAGING
ROLLER BEARING PROTECTION

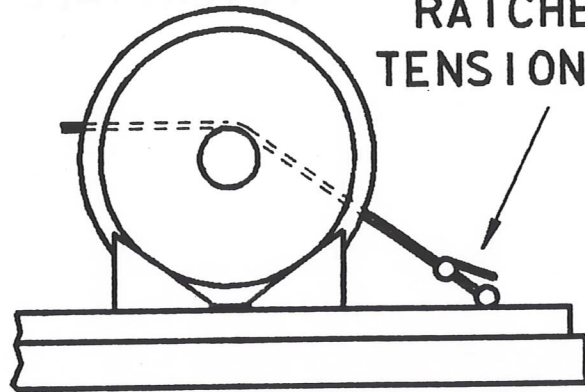
SHOULD NOT HARM PRODUCT

SUITABLE LOAD
RING IN
FLOOR

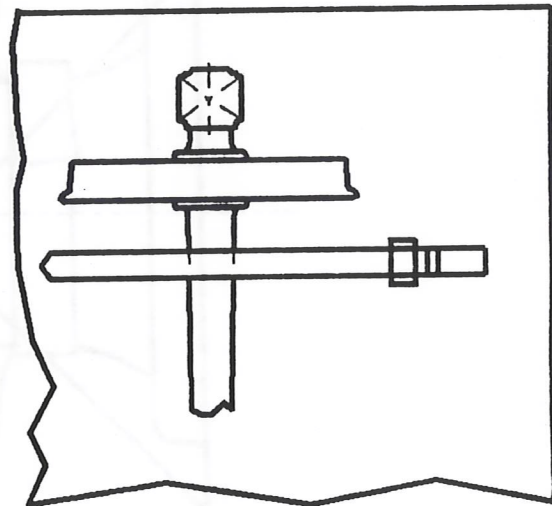
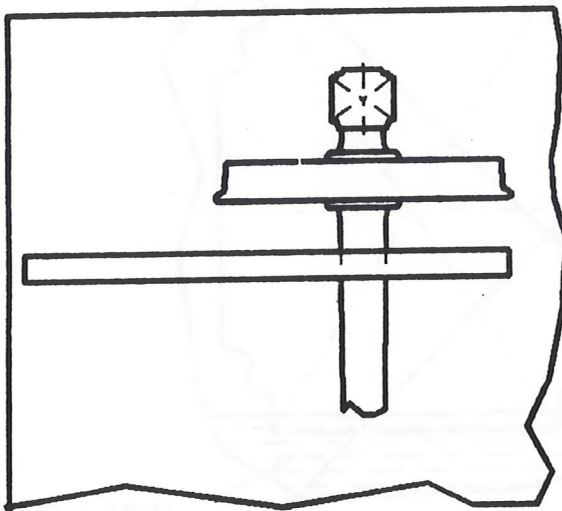


100 x 100 TIMBER RAIL
SECURED TO FLOOR

RATCHET
TENSIONER



TIMBER SCOTCHES
ADJUSTED TO SUIT
WHEEL DIA & SECURED
TO TIMBER RAIL



WHEELSETS SECURED BY FIBRE WEBBING
AND RATCHET TENSIONER

FIG.18 - WHEELSET TRANSPORT

NOTE: FOR FURTHER EXAMPLE SEE BR30054/2
WORKING MANUAL FOR RAIL STAFF

POTENTIALLY HARMFUL TO PRODUCT

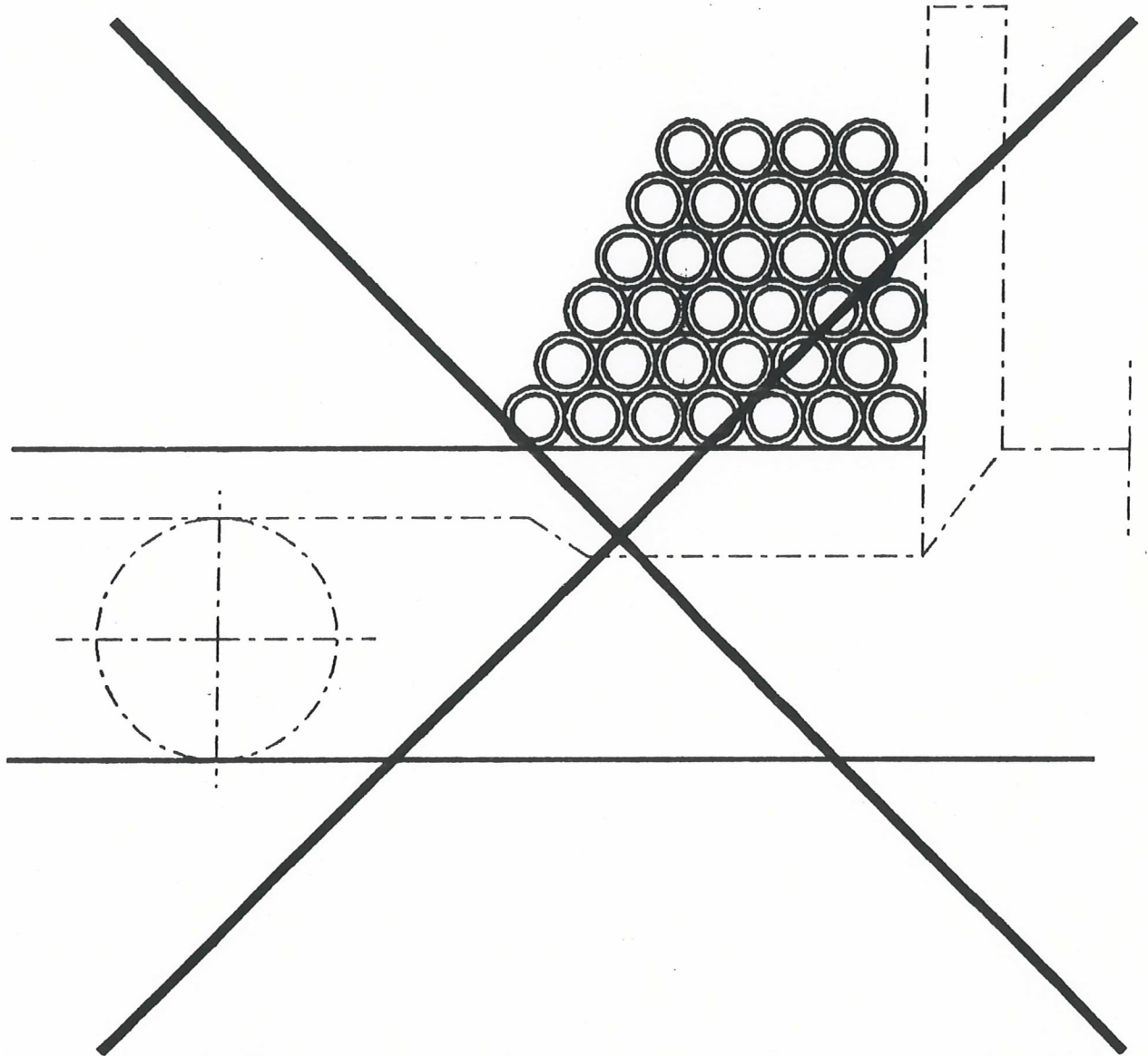


FIG.19 - AXLE TRANSPORTATION

