Report 98-106

Train 201

collision with displaced load

Longburn

28 March 1998

Abstract

On Saturday 28 March 1998 at 1707 hours Train 201, the southbound Auckland to Wellington *Overlander* passenger express, struck a displaced load on Train 242, a Wellington to Palmerston North express freight train which was berthed in the Longburn loop. There were no injuries. Train 201 suffered superficial damage to the locomotive and carriages. Safety deficiencies identified were:

- the lack of appreciation of correct load securing requirements
- insufficient training of staff involved in loading
- the lack of adequate standards and procedures to prevent the use of unsuitable restraining devices.

Three safety recommendations were made to address these deficiencies.

The Commission investigated this incident because of the potential for loads which have moved in transit to endanger other trains and third parties adjacent to the track.

Transport Accident Investigation Commission

Rail Incident Report 98-106

Train type and number:	Passenger express 201 Express freight 242
Date and time:	28 March 1998, at 1707 hours
Location:	129.5 km North Island Main Trunk at Longburn
Type of occurrence:	Collision with displaced load
Persons on board Train 201:	Crew: 3 Passengers: approximately 50
Persons on board Train 242:	Crew: 1
Injuries:	Nil
Damage:	Minor damage to the locomotive handrail and a carriage ventilator grill on Train 201 and to a trackside signal standard.
Investigator-in-Charge:	R E Howe

1. Factual Information

1.1 Narrative

1.1.1 Train 242 was a rostered Tranz Rail Limited (Tranz Rail) express freight operating between Wellington and Palmerston North on Saturday, 28 March 1998.

1.1.2 The train consist was locomotives DX5120, DC4277 and DC 4231 and 23 wagons. The gross weight of the train was 845 t with a total length of 353 m. It was crewed by a locomotive engineer (LE).

1.1.3 At Longburn (approximately 6.4 km south of Palmerston North) Train 242 was signalled into the loop in order to cross Train 201, the southbound Auckland to Wellington *Overlander* passenger express.

1.1.4 The LE of Train 201 stated that on approaching Longburn at approximately 1707 hours at a speed of approximately 90 km/h, he noted a yellow over red[1] on Signal 18L, the Home Signal for Longburn, with Train 242 berthed in clear on the loop. He started applying the brakes to slow down and be prepared to stop at Signal 12L approximately 1 km ahead.

1.1.5 At the point where the locomotives of the two trains were crossing, the LE of Train 201 noted that something was hanging foul from the rear of Train 242 and anticipating that it could impact with his train, applied emergency braking.

1.1.6 Train 201 could not stop in the distance available and collided with the overhanging load, causing superficial damage to Train 201. The locomotive (DFT7067) hand rail was bent with damaged ventilators and scratched paint to the left side of the passenger cars approximately 1160 mm above rail level. The Train Manager stated that the passengers were unaware of what had happened.

1.1.7 The LE estimated that the speed of Train 201 at the point of impact was approximately 20 - 30 km/h.

1.1.8 Damage to Train 201 was minimal and it departed Longburn at approximately 1720 hours.

1.1.9 The LE of Train 201 stated that on exiting Longburn he had to stop his train and temporarily reposition Signal 8L which was angled over and foul of the main line just to the south of the main line points. It had been hit by the displaced load on Train 242 as it had entered the loop. There were no other signs of damage caused by the displaced load south of the damaged signal.

1.2 Loading details

1.2.1 The displaced load was a trailer mounted agricultural implement ("Sidewinder") with large section pneumatic tyres on its single axle. Figure 1 shows the load temporarily secured back to the side of the wagon following the incident.

1.2.2 Movement of the load during transit had allowed the rear of the load to fall off the left side of the wagon (in direction of travel) with the load restrained only by the front strop. The LE of Train 242 stated that when he looked back at his train he was unaware of the situation as he was seated on the right side of the locomotive.

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[1]A yellow over red signal was a standard way of indicating that the train was safe to enter the section ahead but must travel at such a speed as to be able stop at the next signal at red.

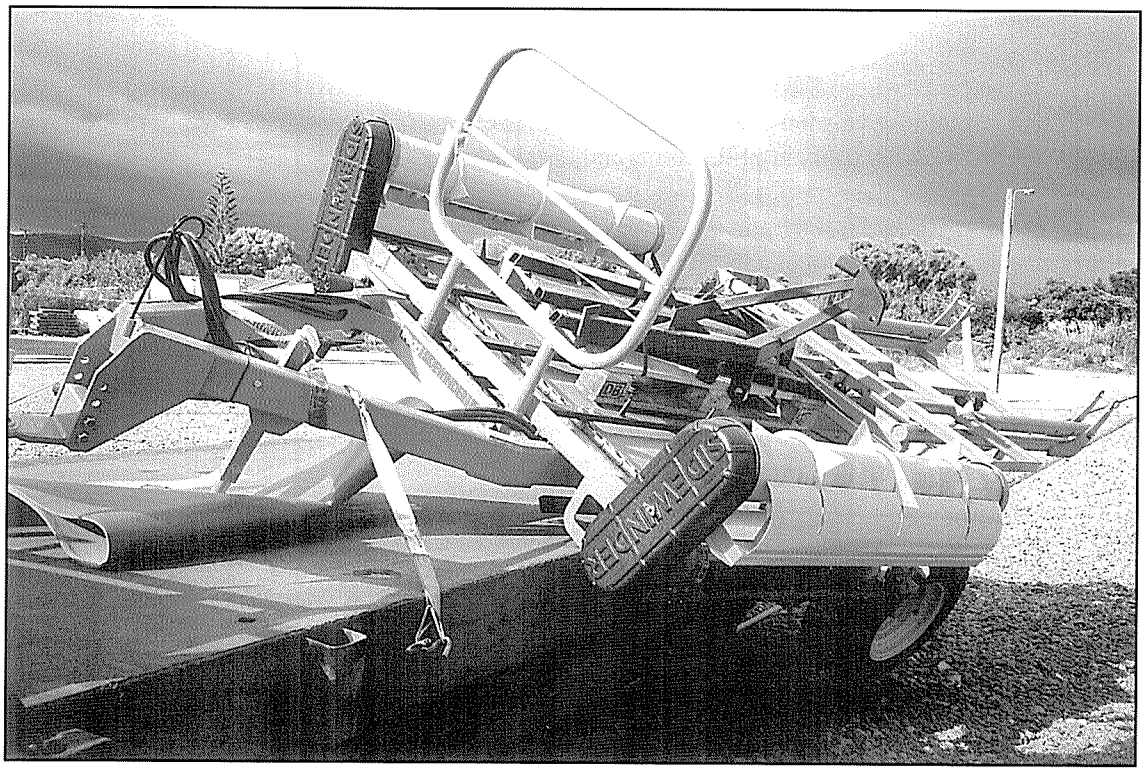

Figure 1
The displaced load

1.2.3 The displaced load was at the trailing end of wagon US3985 and one of four items loaded on the wagon. US3985 was the last wagon on Train 242.

1.2.4 The displaced load was fastened by two "Ancra Loadbinder" webbing strops, each with a manufacturer's stated safe working load of 2.3 t. The Freight Handling Code required that the combined strength of the lashings must be at least twice the weight of the load and this was achieved. No protective sleeves were used with the strops to prevent chafing, nor any wagon stanchions used to assist in locating the load, nor any chocking placed under the axle of the "Sidewinder".

1.2.5 The front strop had been looped around each leg of the drawbar and tensioned down to either side of the wagon. The tensioning force was resisted by the front trailer prop which was fixed in the "down" position with the foot bearing on the deck of the wagon. These details can be seen in Figure 1, together with a knot in the webbing strop near the top edge of the drawbar "A" frame.

1.2.6 The rear strop on the axle end of the appliance had parted during transit near the left side of the wagon (in the direction of travel), leaving no remnant on that side of the wagon. The right side remnant of the strop was still fixed to the side of the wagon by the ratchet tensioner with the end trailing on the ground. The broken portions of the strop were later identified by Ancra New Zealand Ltd as being part of a batch complying with NZS 5445:1986.

1.2.7 The LE of Train 242 stated that following the collision he attempted to pull the load back onto the wagon by re-attaching the right hand portion of the broken rear strop onto the load and tightening it with the ratchet that was still attached to the side of the wagon. However as soon as he applied tension, the strop broke again leaving 6.62 m of strop attached to the wagon and a broken portion 1.43 m long. The total length of a new strop was 8.24 m.

1.2.8 Figure 2 shows details of one of the strops used to secure two tractor tyres on wagon US3985 and in particular the knot placed in the strop to overcome a weak section of the strop. Although knotting can reduce strength by up to 50% the tractor tyres had not moved on the wagon.

1.2.9 Figure 3 shows a partially severed old "NZR" strop used in fixing one of the other pieces of agricultural machinery to wagon US3985. This strop was in poor condition and had no safe working load stated on it. The load it restrained had not moved.

1.2.10 One of the loading staff stated that because of the shortage of strops, they were compelled to use any strops they could "lay our hands on".

1.3 Loading and transport details

1.3.1 The displaced load was loaded on wagon US3985 at the Timaru freight yard on 26 March 1998 with two other separately secured items of agricultural machinery and two tractor tyres. It was at the rear of the wagon and the only item with a pneumatic tyred axle.

1.3.2 The Leading Freight Operator who carried out the loading stated that he stropped the machine at the rear from one side of the wagon over the stub axle, along to the other stub axle and back to the wagon on that other side. He considered that the strops he used on the load were in good order but conceded that on another load he used a knotted strop in a non-critical area "as an extra to give more support . . . no more strops left in the shed".

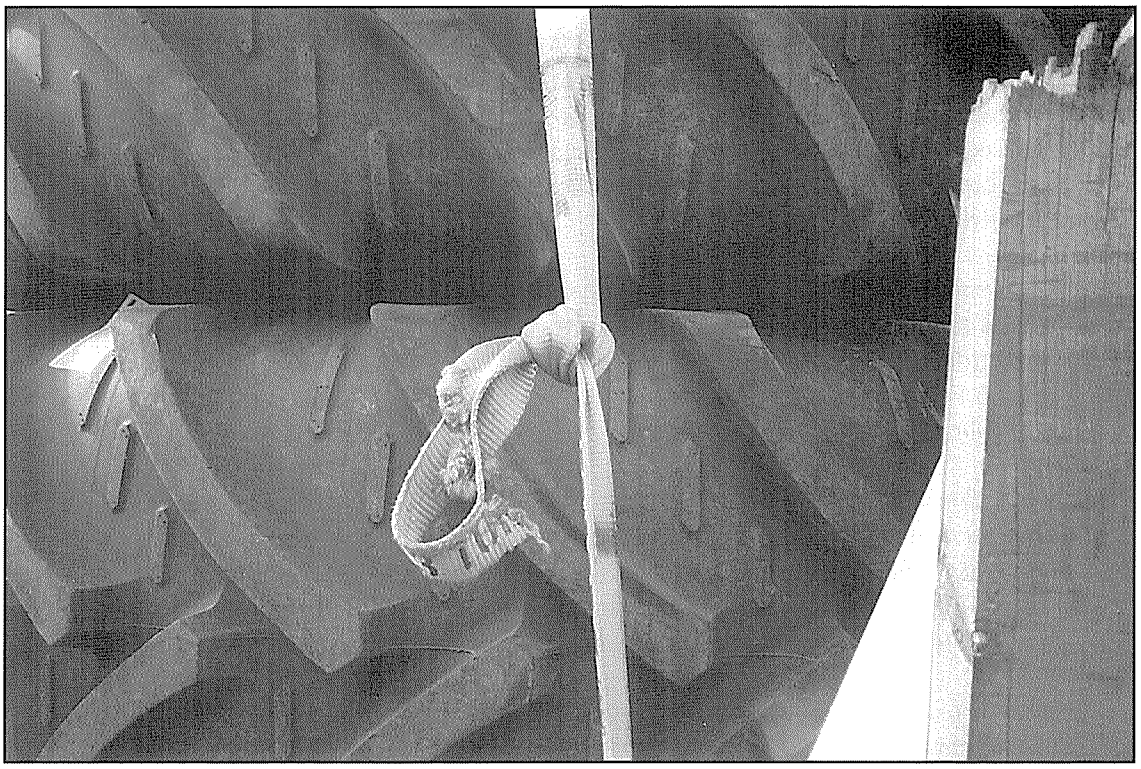

Figure 2
Knotted strop securing tractor tyres

Figure 3
Partially severed strop used on wagon US3985

1.3.3 The staff stated that they had sent other similar appliances around the country, fixed in a similar manner and had not experienced any problems. Over the last 12 months they estimated they had loaded and consigned approximately 100 "ugly" loads from their Freight Depot without mishap.

1.3.4 A Tranz Rail Loadout Sheet was signed out "fit to travel" by the Freight Operator who had loaded wagon US3985. The Operations Supervisor who normally carried out the checking said that because of an altered shift arrangement and the late loading (at 1730 hours) he was unable to sign the load as "fit to travel" but was confident in the ability of his Freight Operators to make a correct judgement regarding the fitness of the load for travel.

1.3.5 The Tranz Rail detailed "Checklist" required for freight items on UR, US and other miscellaneous flat top wagons was not completed for the load. This "Checklist" took the place of a loadout sheet for loads of this nature. A copy of a "Checklist" is attached as Appendix 1.

1.3.6 The load was conveyed by Train 922 to Middelton (Christchurch) on 26 March 1998; by Train 776 to Picton on 27 March 1998; by ferry to Wellington and thence by Train 242 to Longburn on 28 March 1998.

1.3.7 Train examiners carried out normal train examinations at each outgoing train service at Timaru, Middelton and Wellington without detecting any load abnormalities.

1.3.8 The load was not detected as being overgauge by the electronic overgauge detector at Koputaroa (approximately 20 km south of Longburn). The first physical evidence of the load being dislodged was the damage to the signal standard at the south end of the Longburn yard.

1.4 Freight Handling Code

1.4.1 Tranz Rail's Freight Handling Code covered a wide variety of requirements associated with the safe and stable fixing of loads for transport by rail. Aspects applying to the particular load under report were:

> 5.3 LOAD MOVEMENT
> Loads MUST NOT MOVE in transit.
> They must be restrained either individually or in combination so as to PREVENT MOVEMENT under normal travelling conditions...
>
> 5.6 RULES FOR SATISFACTORY LASHING ON FLAT DECKS
> Lashings must be strong enough to secure the load. A lashing that breaks in transit can cause serious problems...
>
> 5.7 LASHINGS
> All methods of securing, lashing and tying a load are only as strong as the tie-down points.
> The tie-down points must be able to resist movement in all directions, i.e.
> → Forward or Backward
> → Sideways
> → Up and down ...
>
> 5.8 BAULKING AND CHOCKING
> Chocking is the technique of using blocks, wedges and chocks to secure a load. Where possible, loads should be secured against solid walls, ends or the headboards. However this is not always possible since it might produce an unbalanced load.
> Chocking should, where possible, be in addition to other methods of obtaining load security...

5.12 STROPS (or load binders)
Strops (or load binders) are a recent introduction to the options for lashing loads to the load platform. Strops have three advantage:

- ➔ They have quick-fastening and release mechanisms
- ➔ They have built-in tensioning mechanisms
- ➔ They do not damage freight as easily as chains can.

Because it is made of synthetic materials, it does not slacken or tighten when wet.

RULES

- ➔ Strops must comply with NZS 5445
- ➔ Strops must be at least 38 mm wide
- ➔ Strops must be secured across the wagon deck when not in use

DO ...

- ✓ Inspect every piece of webbing every time before being used...

6.1 FREIGHT SENSE

DO ...

- ✓ Make sure the load space and platform conditions are suitable for the size and type of the load
- ✓ Use the right equipment and edge protectors
- ✓ Make sure anchorage points are secure
- ✓ Check the lashings are strong enough and in good condition
- ✓ Tighten all lashings and restraining devices
- ✓ Use fixed restraints where possible
- ✓ Use lots of wedges, dunnage and chocks to prevent movement
- ✓ Check size, height, width and load position
- ✓ Return all equipment which was temporarily removed from any vehicle, wagon or truck
- ✓ Make sure that equipment is licensed or certified for the purpose and rated to the capacity you need ...

19.2 VEHICLES including tractors, threshers etc.

DO ...

RESTRAIN all trucks, passenger vehicles, drilling rigs, agricultural equipment and any other large or unusual vehicle using either
High tensile chains attached to suitable underbody brackets or securing points designed for this purpose

OR

A combination of CHOCKS and LOADBINDER/STROPS on ALL axles ...

1.4.2 Tranz Rail's Site Operations Manual, Part 11: "Handle" (Section H 2.3) required that Transportation Units (TUs) were to be signed off "fit to travel". This was a final check to ensure that the TU was fit for use and correctly loaded in accordance with the Freight Handling Code.

The Manual requirements included:

> NOTE 5.
> The "Fit to Travel" inspection is the final check to ensure that:
> - TU is fit for use
> - TU correctly loaded in accordance with the Freight Handling Code
> - Check load flag raised in Amicus (if required)
> - All documentation correct e.g. waybills, hazardous, overgauge permits
> - ALL doors etc. are closed, seals in-place, and recorded
>
> NOTE 6.
> Each TU must be checked by a Team Leader, Supervisor or Manager and the Loadout Sheet or UR/US Flat Deck Wagon Checklist signed off to authorise each TU as "Fit to Travel"

The load in question was loose freight loaded on a US wagon and therefore required authorisation as "fit to travel" by "Checklist". The "Checklist" required the final check to be done by someone other than the person who loaded the wagon. (Appendix 1)

1.5 Personnel

1.5.1 The wagon was loaded by a Leading Freight Operator and a Freight Operator at Timaru. The Leading Freight Operator had five years rail experience with 23 years previous experience with truck freighting firms. He had attended a one week freight handling course with Tranz Rail approximately four years ago. The person assisting him had been with Tranz Rail for approximately two years as a forklift driver/freight operator and had eight years prior experience with road carrying concerns. He had attended Tranz Rail's one week freight handling course.

1.5.2 The Operations Supervisor joined New Zealand Railways in 1981 and had a number of years experience in Timaru as a Freight Supervisor before moving into his present position in 1995.

2. Analysis

2.1 The strops

2.1.1 The total length of the two portions of the broken rear strop that were recovered were approximately 200 mm short of the standard length of a new strop. Taking into account the amount of stretch in a used strop, the amount missing would be considerably more. The missing portion was not found.

2.1.2 An examination of the failed strop, and the condition of the strops on the balance of the wagon loads, suggested that the strop broke as a result of either:

- a weak section in the strop reducing its effective cross-section (and therefore its load carrying capacity) or
- chafing where the strop wrapped around a sharp edge of the machinery

The recovered portions of the failed strop gave no clear indication of the failure mode.

2.1.3 The lack of chocks supporting the axle on the item of agricultural machinery would have allowed the load to bounce on its pneumatic tyres, inducing greater loads and thereby aggravating any existing weaknesses in the strops.

2.1.4 Securing loads by using strops looped over machinery components with the ends fastened to each side of the wagon did not provide sufficient restraint to prevent the load from moving laterally (even if the strop did not part). Vibration and sideways movement of the machinery component could allow the loop to move along the strop. To prevent this the item should have been secured separately from each side of the wagon.

2.2 Non observance of code requirements

2.2.1 The loading team did not meet the requirements of Tranz Rail's Freight Handling Code (refer 1.4) in a number of areas.

a) Section 5.3

There was nothing to suggest that the movement or operations of the train(s) conveying wagon US 3985 was out of the ordinary.

b) Section 5.12

The evidence of knotted and partially cut strops on wagon US 3985 indicated the loading team used substandard strops. Freight handling personnel at Timaru stated this practice developed due to a lack of suitable strops at Timaru.

c) Section 5.7

The tie-down points on the load could not resist movement in all directions.

d) Section 5.8

No chocks were used to secure the load.

e) Site Operations Manual, Section H 2.3, "Checklist".

Such a load on a US wagon required a "fit to travel" authority by "Checklist" i.e. a detailed check signed by a Team Leader, Supervisor or Manger not involved in loading the wagon. In the event the load was authorised to travel on a standard Loadout Sheet signed by the Freight Operator who loaded it.

3. Findings

Findings and safety recommendations are listed in order of development and not in order of priority.

3.1 The failure of the rear strop on wagon US 3985 allowed the load to move resulting in the collision with Train 201.

3.2 There were no reports of abnormality in the handling or operation of the trains that would have caused the rear strop to break prematurely.

3.3 The main cause of the strop failure was the use of an inappropriately fastened substandard strop at the place of loading.

3.4 Tying down the load without the use of chocks under the axle allowed the load to bounce in transit and aggravated the weakness in the strop.

3.5 The weakness was aggravated by the absence of protective sleeves over the strops at the edges of the machinery to prevent chafing.

3.6 The shortage of strops at the Timaru freight centre encouraged the use of substandard strops.

3.7 Freight handling staff displayed a lack of knowledge of the requirements of Tranz Rail's Code requirements for the safe securing of loads, and their despatch.

3.8 The absence of any reported problems with the relatively high number of loads with similar fixing details consigned from Timaru resulted in a sense of complacency within the staff.

3.9 The checking and compliance monitoring regime in place at Timaru failed to identify the deficiencies in wagon loading.

4. Safety Actions

4.1 Tranz Rail has recently convened a working party to look at aspects of load security following a number of incidents. The following safety recommendations will assist the working party to ensure the issues identified in this incident are addressed.

5. Safety Recommendations

5.1 On 27 July 1998 it was recommended to the Managing Director of Tranz Rail that he:

5.1.1 Improves the training of freight handling staff to a standard which will ensure the safe handling of wagons, (058/98); and

5.1.2 Reviews the adequacy of compliance monitoring of wagon loading, (059/98); and

5.1.3 Ensures standards and inspection procedures are in place to prevent the use of strops and other restraining devices which are below desirable standards. (060/98)

5.2 On 3 September 1998 the Managing Director of Tranz Rail responded as follows:

5.2.1 The recommendations have been covered in the company's internal report and initiatives have been taken to address these.

Approved for publication 30 September 1998

Hon. W P Jeffries
Chief Commissioner

Appendix 1

Tranz Link

CHECKLIST FOR LOADING LONG, LIGHT & LOOSE FREIGHT ON UR, US & OTHER MISCELLANEOUS FLAT DECK WAGONS

Loads which are Long, Light or Loose are Loading Irregularities just waiting to happen. These sorts of loads when badly stowed represent a very real danger to the safety of others, and to the likely loss/damage of our customers freight. So THINK about WHAT the load is, WHERE the load is going, HOW best to get the load there in one piece, WHAT equipment you need to achieve that, and WHO is the best person to stow the load securely!

PLAN YOUR LOAD - THINK PREVENTION!

One checklist is to be fully completed for each wagon loaded (Where prompted use ☑ for YES & ☒ for NO)

LOAD PLANNED BY: _____
Team Leader, Supervisor or Manager's Name

WHAT is the load _____

Is the load Long, Light or Loose? ☐

Is it oversized or overweight? ☐

Is it hazardous? ☐

WHERE is the load going _____

From your experience will the load receive heavy shunts or be subject to heavy braking? ☐

...re weather conditions e.g. rain, wind or rough seas a factor that need to be considered? ☐

Does the load require an overgauge permit? ☐

HOW best to get the load there

Box wagon/container to be used if possible rather than a flat deck wagon e.g. for light or loose freight? ☐

Consolidate with other freight or hold over to ensure a secure and safe load? ☐

Load needs to be checked en-route? ☐

Ropes to be used: Quantity _____

Strops to be used: Quantity _____

Chains to be used: Quantity _____

Nets to be used to additionally secure the load? ☐

Tarpaulins to be used to reduce the effects of wind ...id rain? ☐

Specify dunnage/chocking requirements: _____

_____

WAGON LOADED BY: _____
Loader's Name

DATE LOADED: _____

WAGON NUMBER: _____

LOAD the freight

Organise a loading sequence for when freight is arriving, where it's going and what type of freight it is

Secure the load as you go, with heavy freight on the bottom, and separately secured to provide a solid foundation for the light freight above

LOAD securement check

Is the wagon fully equipped with staunchions? ☐

Does the wagon have a headboard? ☐

Have you used the right number of devices to secure the load e.g. ropes, strops, chains, nets? ☐

Have you loaded the wagon to allow for the position of tie down points along the length of the wagon? ☐

Have you correctly positioned the strop webbing protectors or used cornerboards/folded tyre dunnage to protect webbing/ropes from being cut or damaging the freight? ☐

Have you used nets to additionally secure the load? ☐

Have you covered the load with tarpaulins? ☐

Have you used the right sort of chocks and dunnage? ☐

IF IN DOUBT ASK SOMEONE WHO KNOWS

Loading Diagram

FINAL CHECK BY SOMEONE OTHER THAN THE PERSON WHO LOADED THE WAGON TO ENSURE THE:

- wagon is fit for use ☐
- wagon correctly loaded in accordance with the Freight Handling Code ☐
- check load flag raised (if required) ☐
- all documentation correct e.g. waybills, hazardous, overgauge permits etc. ☐
- other (specify): _____ ☐

Wagon authorised FIT TO TRAVEL _____
Team Leader, Supervisor or Manager's Signature

Form 8 10 October 97