Report 98-112

yard shunt

log fall from wagon

Mount Maunganui

25 August 1998

Abstract

On Wednesday, 25 August 1998 a number of 3.7 m long logs fell from the last wagon of a rake of loaded log wagons in Mount Maunganui railway yard.

The loss of load occurred because the logs were not adequately restrained by the cradle supports at either end. A safety issue identified was the adequacy of the code covering the securing of 3.7 m logs on standard log wagons.

The Commission investigated this incident because of the potential for displaced logs to endanger other trains and third parties adjacent to the track.

Transport Accident Investigation Commission

Rail Incident Report 98-112

Train type and number:	Yard shunt
Date and time:	25 August 1998, 0400 hours
Location:	Mount Maunganui yard
Type of occurrence:	Log fall from wagon
Persons on board:	Nil
Injuries:	Nil
Damage:	Nil
Investigator-in-Charge:	R E Howe

1. Factual Information

1.1 Narrative

1.1.1 On 25 August 1998 Train 427, a rostered Tranz Rail Limited (Tranz Rail) freight train, was operating between Kinleith and Mount Maunganui.

1.1.2 The train consist was two locomotives, DC4029 and DC4035 with 20 loaded log wagons on the head of the train and 30 assorted wagons behind. It was crewed by a locomotive engineer (LE) and departed Kinleith at 0035 hours.

1.1.3 All the log wagons were loaded with 3.7 m pinus radiata logs of varying diameters in two bundles per wagon, each bundle being contained by a pair of wagon cradles. The cradles were intended to restrain uniform and unmatched length logs loaded to code requirements and the logs were conveyed without belly strops or chains.

1.1.4 On arrival at Mount Maunganui at 0315 hours a new LE took over at the yard terminal building, the train was berthed in one of the yard arrival roads and the locomotives were cut off at the north end.

1.1.5 Both of the LEs and the pilotman stated that at this stage the attitude of the logs on the log wagons was normal and they were contained by the wagon cradles.

1.1.6 At approximately 0400 hours a DH shunt locomotive operated by a remote control operator coupled on to the south end of the rake and pulled it south to a position where a shunter could uncouple the log wagons from the container wagons for the latter to be shunted to a wharf shed.

1.1.7 There was only one shunting service operating at Mount Maunganui yard on the morning of the incident.

1.1.8 On the return of the shunt locomotive it was coupled on to the south end of the log wagons ready to pull them south.

1.1.9 As the shunt proceeded the shunter on the ground noted that some logs were protruding from wagon Usl 3868, the last wagon in the rake, and requested by radio that the remote control operator stop the shunt. The shunt stopped with the front portion of the rake blocking the wharf level crossing. During all movements automatic train braking was used when slowing or stopping the rake.

1.1.10 On examining the last wagon it was found that both bundles of logs had shifted bodily southwards and only the south cradles contained the logs as both log bundles had slipped forward clear of the north cradles. The logs were wet and had a large portion of their bark missing. There was no evidence of any recent damage to the wagon.

1.1.11 The shunter stated that to clear the level crossing as soon as practicable he requested the remote control operator to pull the rake forward slowly. Having cleared the level crossing the rake was stopped to uncouple the last wagon. During that movement six logs fell off the left side of the wagon onto the ground.

1.1.12 All 20 wagons were inspected by the Operations Controller immediately after the logs had fallen off but before the wagons had started to be unloaded. He stated that the only logs to be displaced were those on Usl 3868 and that the remainder of the wagons "were perfect" and showed no evidence of having moved with respect to the log cradles with all logs loaded to below the top level of the cradles. A 36 hour delay in incident notification meant that the logs had been unloaded and were not available for inspection by the investigator when he arrived on site.

1.1.13 The shunter stated that 3.7 m logs had dislodged previously in the yard. Tranz Rail advised this related to an incident which had occurred about three years ago as a result of a wagon receiving a heavy shunt.

1.1.14 On 25 August 1998 a separate incident was reported at Tauranga when a 3.7 m log was found lying foul of the crossing loop by the LE of Train 355. It was thought to have fallen from Train 487, a Kinleith to Mount Maunganui express freight which departed Kinleith at 1830 hours on 24 August 1998. The LE thought the log was about 300 mm in diameter.

1.1.15 The Land Transport Safety Authority (LTSA) were asked for details of all reported incidents of 3.7 m logs falling from wagons since 14 October 1997 (the date of a log fall incident near Tokoroa, investigated by the Commission, TAIC Occurrence Report 97-111). The following information was supplied:

	Date	**Locality**	**Comment**
1	3.11.97	Paengaroa	found trackside at 125.5 km
2	6.11.97	Paengaroa	found trackside at 128 km
3	19.11.97	Mt Maunganui Branch	fell from wagon near Hull Road crossing
4	14.1.98	Studholme	log fall between wagons
5	23.2.98	Te Puke	found trackside
6	4.11.98	Waharoa - Hemepo	found trackside at 58 km
7	6.11.98	Hauone - Awakaponga	found trackside
8	13.11.98	Te Puke - Pongakawa	found trackside at 131 km

For 1 - 5 LTSA had no information on the length of the logs.
For 6 - 8 LTSA advised they understood all logs were 3.7 m long.

1.2 Subsequent information

1.2.1 The narrative relates to the original incident as reported by Tranz Rail and investigated by the Commission. Approximately two months after the incident Tranz Rail advised logs had fallen off the same wagon earlier in the day and the Commission extended its investigation to assess the relevance of this additional information.

1.2.2 The Tranz Rail Service Manager (Forestry) stated that when he first saw the dislodged logs in the port area he considered the wagon was not fully loaded, even allowing for the six logs that had fallen off. However when he looked down the track from where the load had come from he did not see any other displaced logs and felt that he must have been wrong in his assumption.

1.2.3 At approximately 0830 hours on the day of the incident the Service Manager (Forestry) received a call from the Train Examiner Operations to say that approximately 15 logs had been found along the arrival road near to where train 427 had been berthed. Arrangements were made for them to be cleared away by a local contractor.

1.2.4 The fork lift operator confirmed that he had picked up the logs, which were strewn over a distance of 20 to 30 m, and conveyed them to the port area. Protection and piloting for the pick up was carried out by the Train Examiner Operations.

1.2.5 With the elapse of time none of the parties concerned could remember the exact position of the logs along the arrival road, although they were estimated to have been approximately 200 m south of the original position of Usl 3868 when first positioned in the arrival road.

1.2.6 Apart from the three people directly involved, Tranz Rail management and operating staff had no knowledge of the logs picked up at the arrival road until two months after the incident.

1.3 Site details

1.3.1 The Mount Maunganui yard is laid in heavy weight rail on treated softwood sleepers. It is bedded on clean crushed metal ballast and showed no evidence of excessive misalignment either horizontally or vertically.

1.3.2 The track from Kinleith to Mount Maunganui is all in class 'A' heavy weight track. The LE of Train 427 stated that there were no sections of the track that gave him concern in his handling of the train.

1.3.3 The maximum authorised speed on this section of track was 55 km/h and the LE stated that he was travelling at the authorised speed. The locomotive event recorder was extracted to allow downloading and analysis.

1.4 Control of log loading

1.4.1 The incident near Tokoroa on 14 October 1997 resulted in some changes to the Tranz Rail Freight Handling Code which were intended to:

- reduce the allowable log heights with respect to the cradles
- redefine longitudinal projection of 3.7 m logs with respect to cradles
- clarify the need for chains/strops especially with regard to 3.7 m logs.

The changes were made specifically to safeguard against a log freeing itself from the top of a log stack during transit, while taking account of the overall stability requirements for 3.7 m logs.

1.4.2 The wagons on Train 427 were loaded at the rail sidings at the Carter Holt Harvey Limited (Carter Holt Harvey) mill site at Kinleith by a private contractor working for Carter Holt Harvey. The operation is under the control of a Log Yard co-ordinator employed by Carter Holt Harvey.

1.4.3 Tranz Rail Freight Handling Code, Section 16 - 'LOGS' (see Appendix 1) set out the amended loading parameters for logs on wagons following the Tokora incident. Both Carter Holt Harvey and their loading contractors were familiar with the code.

1.4.4 The code included the maximum height to which logs could be loaded with respect to the top level of the wagon cradles and the required overhang of the logs with respect to the cradles. Diagram 16.1 of the code permitted the logs to be loaded up to the top of the cradle (prior to the Tokoroa incident the code allowed that one third of the diameter of the log, but never more than 200 mm, could protrude above the cradle). The logs must also "visibly project" beyond each cradle (previously they had to project by at least 150 mm).

1.4.5 The contractors used "stackers" (log loading machinery) to load the wagons. The stackers were also used to both level off the logs to the required height and to ensure the correct overhang of the logs with respect to the stanchions. This work was carried out at the loading site.

1.4.6 The Carter Holt Harvey Log Yard co-ordinator advised that following the Tokoroa incident their staff had been retrained to the different code requirements and had generally had no difficulty in following them. A small number of loaded wagons had been rejected by Tranz Rail staff but it was stated that as the delay in readjusting a load could mean the missing of a transport connection, it was in Carter Holt Harvey's interest to ensure correct loading. No specific details could be recalled of any abnormality of the loading of the wagons that made up Train 427 on 24 August 1998.

1.4.7 Once loaded, the wagons were conveyed by the Tranz Rail shunting service to the Kinleith yard.

1.4.8 The Tranz Rail shunters and train examiner at Kinleith stated that they could not recall any incorrect loading of the rake of wagons for Train 427 on the day.

1.4.9 Tranz Rail staff who attended the spill and inspected the wagons commented on the apparent comparative shortness of some of the logs on the wagons. A check with Kinleith mill showed lengths were controlled at 3.7 m and the mill considered it was unlikely that shorter logs were consigned. The actual log lengths were not checked at the time by Tranz Rail staff.

1.5 Personnel

1.5.1 The LE of Train 427 had 34 years railways experience and considerable experience as an LE with log trains.

1.5.2 The LE who berthed Train 427 at the beginning of his shift at Mount Maunganui had 21 years railway experience, including 16 years as LE. He transferred to Mount Maunganui in December 1997.

1.5.3 The remote control operator started with Tranz Rail in 1991 as a traffic operator and became a fully certified remote control operator in 1994. He had spent all of his time at Mount Maunganui where he is one of six designated operators.

1.5.4 The Train Examiner Operations had 22 years railway experience of which 15 years had been at Mount Maunganui and the last six years qualified in his current position.

2. Analysis

2.1 General

2.1.1 With the rail transport of 3.7 m logs the rail corridor tends to isolate any spills that do occur but the potential consequences are just as serious as in other modes of transport. This was highlighted in TAIC Occurrence Report 97-111 concerning a 3.7 m log which bounced into a residential property from a log train.

2.1.2 Even out of the public arena in a railway yard such as Mount Maunganui falling logs create a serious hazard for staff who may be in the vicinity.

2.1.3 The log found on the Tauranga loop on 25 August 1998 and other incidents during 1997/98 indicated an ongoing problem with the security of 3.7 m logs.

2.1.4 The low weight of the 3.7 m logs in comparison with longer logs of greater diameter increases the tendency for them to move around on wagons.

2.1.5 Despite Tranz Rail's prompt action in reducing load heights following the Tokoroa incident, no significant changes were made to improve security to prevent longitudinal movement of 3.7 m logs.

2.2 3.7 m logs by rail

2.2.1 The use of standard wagons to transport 3.7 m logs contained by only two cradles per bundle placed more emphasis on log stability than in the transport of longer logs, especially near the top of the cradle.

2.2.2 Prior to the Tokoroa incident the Tranz Rail loading code diagram required strops or chains for all loads with a minimum projection of between 75 mm and 150 mm. This conflicted with the code requirement for "uniform length : matched logs" where there was no such provision and the Commission considered that the ambiguity needed clarification.

2.2.3 It was also recognised that the spacing of cradles on standard log wagons did not always allow for the then minimum code overhang requirement for 3.7 m logs.

2.2.4 To address these issues the Tranz Rail code was amended as follows:

> **16.3 LOADING RESTRAINTS**
>
> . . .
>
> The following additional requirements apply to the **VARIOUS TYPES OF LOGS** as shown:
>
> **1) Short Export Logs (under 4.5 m)**
> The top layer of logs **MUST BE SUPPORTED** at one end of the cradle by either another log or the cradle to stop sideways movement
> . . .

16.4 STROPPING

A minimum of **TWO** belly strops **MUST** be used when:

➔ The top layer contains loose logs

➔ Eucalyptus logs are being conveyed

➔ Required by the Forestry Business Unit

Belly strops when applied **MUST:**

➔ Be applied around each bundle to contain all the logs

➔ Be positioned inside the cradles . . .

Diagram 16.1 of the Tranz Rail Log Operating Rules also required that the outside logs must protrude beyond the outer end of each cradle. The accompanying diagram showed that the "Minimum Projection" should be "Visibly Protruding".

2.2.5 The checking of loaded log wagons for safety was carried out at three different levels:

- By the contract log loaders themselves. They have a vested interest to ensure that the wagons are loaded in a way which minimises any adjustment by them. Carter Holt Harvey's Log Yard co-ordinator's responsibility was to ensure that Tranz Rail's Code requirements were met by the log loaders, which required him to check their performance on a regular basis.

- By the Tranz Rail shunters taking the rakes of loaded wagons from Carter Holt Harvey's loading yard to the Kinleith rail yard for marshalling into trains. In addition to their primary duty shunting off wagons, they checked the correct and safe loading of the wagons before they were moved.

- By the Operations Supervisor (train examiner) who had the final responsibility to ensure that the log train, when marshalled, was safe to run. This responsibility included the checking of the loads on the wagons.

2.3 Train handling

2.3.1 Analysis of the event recorder output showed that particular run of Train 427 had not been recorded but staff reports indicated no unusual handling characteristics for Train 427 on the day in question.

2.3.2 Reports indicated that when Train 427 berthed in the Mount Maunganui arrival road all of the 3.7 m long logs were supported by the wagon cradles.

2.3.3 No information was available to indicate whether the logs were loaded centrally on the wagon cradles when they arrived and if not whether this was as a result of initial uneven loading at Kinleith or due to movement during transit.

2.3.4 Logs were displaced from wagon Usl 3868 between the time of uncoupling the locomotives from Train 427 and the pulling of the log wagons to place them in the wharf area.

2.3.5 The likely catalyst to the initial log fall was a large longitudinal force from south to north. The usual causes of such forces are heavy shunting impact or sudden braking but there were no reports supporting such actions. Equally there was no indication of any other external source which may have initiated the fall.

2.3.6 Although the actual cause of the initial log displacement is not known it is likely that it occurred during yard shunting. It is possible that uneven loading or subsequent movement during transit may have resulted in the load on wagon Usl 3868 arriving at Mount Maunganui with some logs only just retained by the wagon cradles with the shunting movements at Mount Maunganui yard providing the final catalyst for complete displacement.

2.3.7 The possibility that some logs were shorter than 3.7 m is unlikely although the actual lengths were not confirmed to eliminate this possibility. Reports indicated the logs on the rake were particularly slippery due to loss of bark and rain. These factors may have contributed to the incident.

2.4 Tauranga log fall

2.4.1 The log reported lying foul of the Tauranga crossing loop is most likely to have fallen from Train 487 from the top layer of logs in a wagon cradle.

2.4.2 Reports indicated that the logs on Train 487 were not loaded above code requirements and it is therefore unlikely that the log would have dislodged over a cradle top. However a loose 3.7 m log on the top of a bundle would only have needed to swivel approximately 20° to get clearance and roll over diagonally past a cradle, or alternatively move 200 mm longitudinally to come free of a cradle at one end.

3. Findings

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

3.1 As far as it is possible to ascertain the logs that fell from the log wagon at Mount Maunganui were loaded at Kinleith in accordance with Tranz Rail Freight Handling Code requirements.

3.2 There is nothing to suggest that the handling of Train 427 or the condition of the track would have caused the logs on wagon Usl 3868 to move between Kinleith and Mount Maunganui.

3.3 The logs were probably contained within their cradles and not over height at the time Train 427 arrived at Mount Maunganui.

3.4 There was no evidence of any external force which may have dislodged the logs.

3.5 It is likely that yard shunting operations were the catalyst for the log displacement.

3.6 Any longitudinal movement of the logs would have been assisted by the logs being wet and with a portion of their bark missing.

4. Safety Actions

4.1 Longitudinal overhang of logs beyond cradles

4.1.1 Prior to the Tokoroa incident, Tranz Rail had already been carrying out trials with the aim of redefining overhang requirements. Following the incident the overhang requirement was reduced to "visibly protruding" to enable 3.7 m logs to be accommodated within the cradle spacing of existing standard log wagons. This amendment regularised a previously unsatisfactory code requirement that was impossible to achieve. However it did not improve the stability of the 3.7 m logs.

4.2 Use of chains/belly strops

4.2.1 The redrafting of the code to address when and where to use chains and strops was actioned by amending the code to require restraint when:

- the top layer contained loose logs
- eucalyptus logs were being conveyed
- required by the Forestry Business Unit.

No specific provisions were included for 3.7 m pinus radiata logs.

4.3 Log restraint trials

4.3.1 Following the October 1997 incident Tranz Rail and Carter Holt Harvey had been carrying out tests on alternative methods of restraining logs less than 4.5 m in length, including the use of webbing strops or chains with a tightening winch mechanism. These trials have not resulted in any new restraint requirements.

5. Safety Recommendation

5.1 It was recommended to the Managing Director of Tranz Rail that he:

5.1.1 Issue instructions requiring 3.7 m logs to be suitably restrained by strops or chains when transported by standard log wagons. (098/98)

5.2 The Managing Director of Tranz Rail responded as follows:

5.2.1 There is more than one way to address the problem of restraining 3.7 m logs and before we finally accept the recommendation we are trialling other alternatives such as reducing the speed of the train and re-spacing the wagon stanchions.

Approved for publication 25 November 1998

Hon. W P Jeffries
Chief Commissioner

Appendix 1

SECTION 16 LOGS

For equivalent guidelines for Road Transportation, see section 3 of this manual.

NOTE. This section provides the requirements for the safe transportation, loading and securement of logs. In the event that any wagon cannot be loaded to meet these requirements, then loading MUST NOT commence, and the problem referred to the Forestry Business Unit (04) 498-2080 for resolution.

16.1 TRANSPORTATION

For conveyance purposes, logs are defined as follows:

- → **SHORT EXPORT LOGS** Length below 4.5 M (uniform length, matched logs)
- → **STANDARD EXPORT LOGS** Length 4.5 M & above (uniform length, matched logs)
- → **RANDOM SIZE/LENGTH LOGS** Includes pulp, firewood etc.

16.2 RAIL LOADING INFORMATION

The following table defines the number of cradles for each wagon type, and describes the maximum loading capacity for each wagon type.

WAGON TYPE	NO OF CRADLES	MAX LOADING CAPACITY
		Tonnes
ULA	4	43
ULB	4	38
ULD	6	30.5
ULE	4/6	38
URL	4	30.5
USL	4	38
FB	2	48
FC	4	53

16.3 LOADING RESTRAINTS

The following loading requirements apply to **ALL TYPES OF LOGS**:

- **ALL OUTSIDE LOGS** of the load (including all those on the top layer) **MUST PROTRUDE BEYOND** the outer end of each cradle supporting the load
- Must **NOT PROTRUDE OUTSIDE** the cradle edges
- Must **NOT PROTRUDE ABOVE** the height of the cradle at either end
- Must be **LOADED CENTRALLY** on the cradles
- Must be **DISTRIBUTED EVENLY** across the cradle
- Must be at least 150 mm **CLEAR OF ALL HANDGRIPS**
- Must **NOT OVERHANG** wagon ends
- The following additional requirements apply to the **VARIOUS TYPES OF LOGS** as shown:

    1) **Short Export Logs (under 4.5 M)**
    The top layer of logs **MUST BE SUPPORTED** at one end of the cradle by either another log or the cradle to stop sideways movement

    2) **Standard Export Logs (4.5 M and above)**
    The top layer of logs **MUST BE NESTLED** at one end of the cradle in the "vee" of the layer of logs below, or supported by either another log or the cradle to stop sideways movement

    3) **Random Length Logs (includes pulp, firewood etc)**
    The top layer of logs **MUST BE SUPPORTED** at one end of the cradle by either another log or the cradle to stop sideways movement, and for logs shorter than cradle length, these logs **MUST BE NESTLED** into the centre of the load

16.4 STROPPING

A minimum of **TWO** belly strops **MUST** be used when:

- The top layer contains loose logs
- Eucalyptus logs are being conveyed
- Required by the Forestry Business Unit

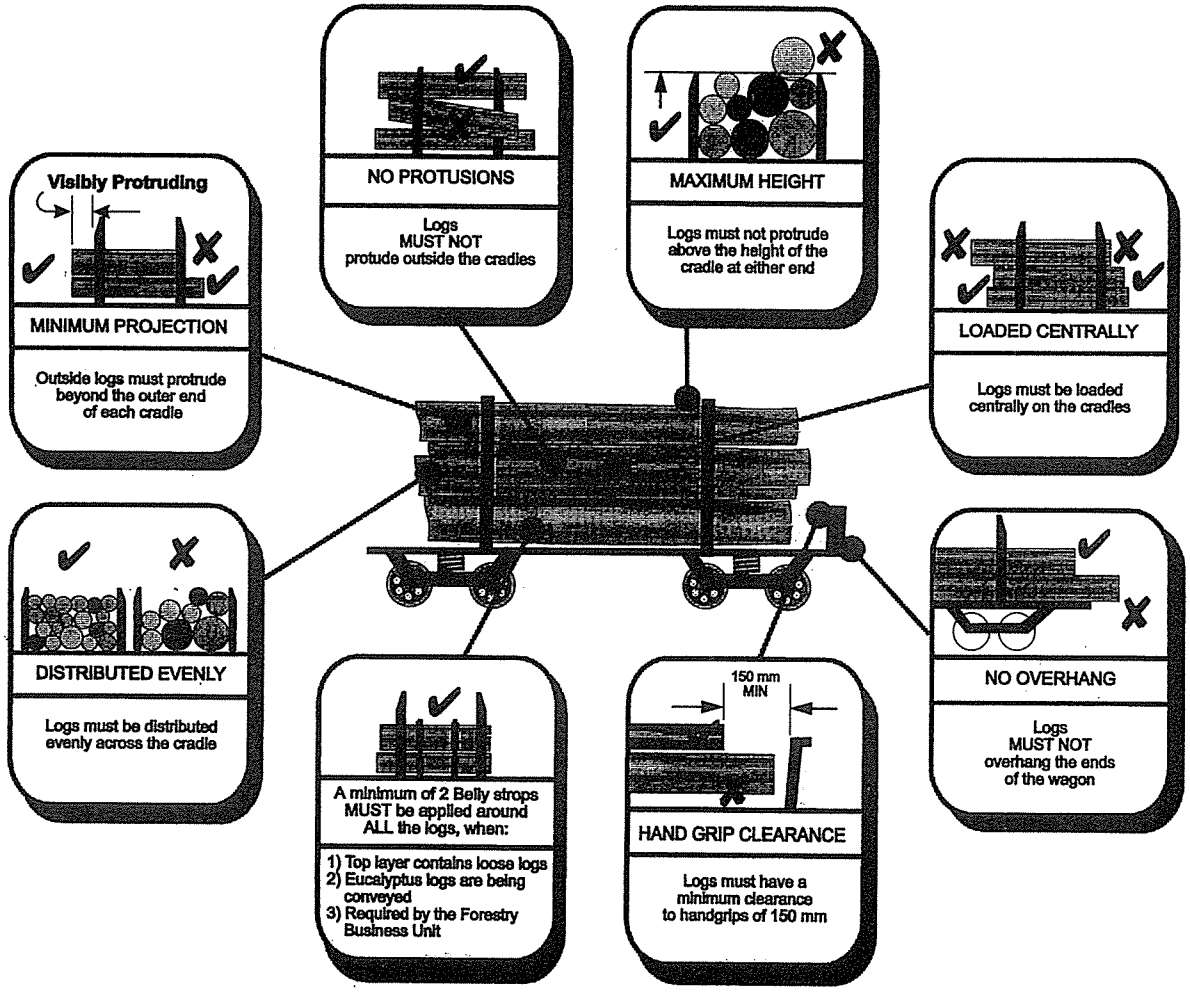
Belly strops when applied **MUST**:

- Be applied around each bundle to contain all the logs
- Be positioned inside the cradles

DIAGRAM 16.1

Tranz Link

LOG LOADING RULES

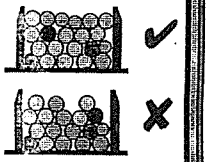


RAIL LOADING DATA

WAGON TYPE	NO OF CRADLES	LOADING CAPACITY (maximum)	LOG LENGTH
		Tonnes	
ULA	4	43	The length of logs that can be loaded is governed by the rules for: *Minimum projection *Handgrip clearance *Wagon overhang *Nestling short logs
ULB	4	38	
ULD	6	30.5	
ULE	4/6	38.0	
URL	4	30.5	
USL	4	38	
FB	2	48	
FC	4	53	

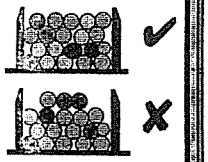
SHORT EXPORT LOGS
(uniform length, matched logs below 4.5 Metres in length)

The top layer of logs must be supported at one end of the cradle by either another log or the cradle to stop sideways movement



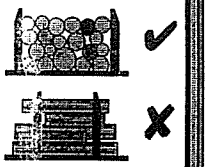
STANDARD EXPORT LOGS
(uniform length, matched logs 4.5 Metres in length and above)

The top layer of logs must be nestled at one end of the cradle in the "vee" of the layer below, or the cradle to stop sideways movement



RANDOM LENGTH LOGS
(includes pulp, firewood etc.)

The top layer of logs must be supported at one end of the cradle by either another log or the cradle to stop sideways movement, and for logs shorter than the cradle length, these logs must be nestled into the centre of the load



For Road Conveyance, refer to "TRUCK LOADING CODE" Chapter 10 Pages 53 - 61