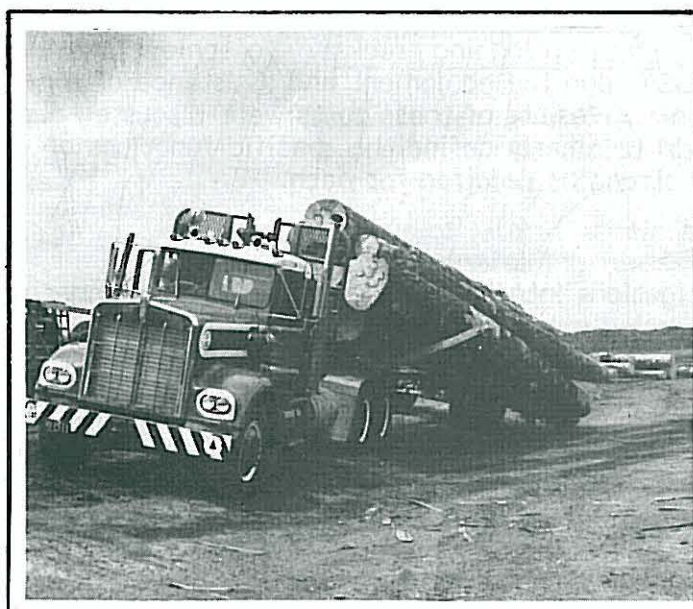


SECURING LOADS ON LOGGING TRUCKS

J.A. Stulen

EA 1729 /31



N.Z. Logging Ind.
Research Assn. Inc.
P.O. Box 147,
Rotorua



Sequence of events during load releasing tests to determine forces in belly chains:

- (1) Wraparound straps released
- (2) Load falls to the ground

INTRODUCTION

Over the past twelve months, LIRA has been involved with the work of an industry committee which has been dealing with problems in securing log loads on trucks. This committee has recently submitted recommendations to the Department of Labour to assist them in their current revision of the "Safety Code for Bush Undertakings - Part 2 : Transportation".

This report discusses and highlights the important aspects of the committee work. A full project report covering all tests and results will be released later this year.

ACKNOWLEDGEMENT

LIRA acknowledges the work of the committee and its members in making its results available for this publication.

BACKGROUND

In November, 1982, the DSIR completed a series of tests and a demonstration for the Institute of Road Transport Engineers (IRTE). These showed how dynamic forces in a logging truck frame and its load securing devices could be measured. The success of this early work encouraged the formation of an industry committee with representatives from the following organisations :-

Ministry of Transport (MOT)
Department of Labour (DOL)
Department of Scientific and Industrial Research (DSIR)
Institute of Road Transport Engineers (IRTE)
Road Transport Association (RTA)
Logging Industry Research Association (LIRA)
and a number of logging companies.

The principle objective of the committee was : "To establish safe and sensible working regulations for the securing of log loads on logging trucks". To achieve this end, more tests were undertaken using the DSIR and the equipment and assistance of a number of logging companies and their staff. Results of these tests were discussed during the seven committee meetings held to clearly define the specific functions of various log load securing devices and the strengths required for each.

TESTS

During the course of these investigations into load securing devices, a number of special tests were designed and carried out on logging trucks and trailers.

In November, 1982, the first tests took place as well as a demonstration of dynamic force measurement. An eight day programme was completed. A conventional 5 axle long log unit (Kenworth W924R logging truck towing a Road Runner 2 axle off-highway jinker trailer with 2.75 metre wide bunks) was fitted with resistance strain gauges and run through a normal work cycle. Forces on the truck were measured during loading, unloading, travelling over various road surfaces, low and high speed cornering tests and static tests to simulate wraparound stop failures (see photos).

Following an analysis of the test results, further trials were arranged. In June, 1983 a series of static tests were carried out using radiata pine and eucalyptus log loads. The effectiveness of a number of chain and wire rope configurations was checked in stopping or reducing log movement under experimental conditions set up to simulate heavy braking.

Later in June further strain gauge tests were undertaken. A five day test programme was completed using a short log unit pulling a full trailer with an on-highway payload. Once again, the unit was run through normal work cycles while the forces acting on it were measured. In these tests attention was focused on activities which had previously shown high loading characteristics.

TEST RESULTS

The dynamic tests confirmed a number of earlier speculations on high loading situations but, in some cases, results were significantly different from what was expected. It was found that :

- peak acceleration figures were recorded of 0.78 g * forward deceleration during emergency braking and 0.45 g lateral acceleration during tight turns.

* "g" is gravitational acceleration

- loads in wraparound strops and stanchions peaked during low speed tight turns at higher values than for high speed manoeuvres.
- belly chains were loaded in tension to the order of 12000 Kg and higher when a complete truckload of logs was released from a stationary truck.
- belly chains/strops are not an effective back-up safety device for drop stanchions with wraparound strops. Only throwover chains/strops meet this requirement.
- stanchions and bolsters are highly stressed repeatedly during cornering and log loading/unloading.

The tests did confirm that the design values now recommended by the committee are adequate as basic requirements. The load restraining system must be capable of containing the load under three particular conditions :-

- (1) Forward deceleration under emergency braking conditions when the combined restraining forces must be at least equal to the payload masses (i.e. a force of 1.0 g).
- (2) Rearward deceleration when braking during reversing when the combined restraining forces must be at least 50% of the payload masses (i.e. 0.5 g).
- (3) Sideways or lateral acceleration when cornering when the combined restraining forces must be 50% of payload masses (i.e. 0.5 g).

SAFETY

The tests reaffirmed important points from the Safety Code for Bush Undertakings :

- the driver of any truck has the final responsibility to ensure that his truck is loaded correctly.
- logs are not to be loaded above the stanchion or stanchion extension.
- repair of securing chains by welding is not permitted.
- on trucks with drop stanchions : a throwover strop or chain is to be fitted to each set of stanchions and all fittings and components must be capable of holding the stanchions in an upright position should the wraparound strop fail.
- on trucks with fixed stanchions where throwover strops or chains are used to secure a load, there must be one at each set of stanchions. Alternatively, a single belly chain in the centre of each load may be used.

During the course of its work, the committee decided that in making recommendations to alter this code, it would be desirable to suggest a format change. The format suggested by the committee has three distinct sections :-

- (1) Design Requirements

The basic requirements which must be met in design of a log cartage vehicle are outlined. They have been kept as simple and unrestrictive as possible.

(2) Operation and Inspection

Guidelines for everyday use by truck operators and bush inspectors.

(3) Standard Designs

A number of detailed design drawings and specifications for log cartage equipment. These utilise commonly available materials and meet all design requirements.

This format has been proposed with the objective of clearly separating the responsibility for meeting the various regulations. Section (1) contains requirements that designers and manufacturers must meet in producing log transport equipment. Section (2) covers regulations and inspection procedures which are to be carried out in the field. It is felt that bush inspectors should not be required to make engineering checks on equipment.

The standard designs section, (3), is intended to ensure that the engineering requirements are met by any workshop involved in building equipment for log cartage. The detailed designs contained in it meet all the requirements outlined in section (1). This type of information is included in an effort to raise the standard of some of the equipment being built and used. To allow freedom of design, the equipment may be built to any design provided it meets all the specified requirements. If it is not built to the standard design, it should be approved by a registered engineer.

CONCLUSIONS

The recommendations made by the committee and its members are intended to provide essential and workable regulations for the log cartage sector of our industry to follow. The committee views represent not only those of regulatory bodies, but also of equipment manufacturers and users.

It must be noted that the individual tests performed were not intended to cover all aspects or types of log cartage in New Zealand. Instead, this work represents the first time that scientific investigations have been made in order to gain a better understanding of the forces acting on trucks and trailers during log cartage.

The committee recommendations will now be considered by the Department of Labour in forming their revised bush code. The revisions included are still subject to full industry scrutiny (through the Department of Labour). It should be remembered, in considering the changes being proposed, that the primary objective of this code is to promote safe equipment and practices. Safety is of the utmost importance in logging and especially in log cartage where the public can become unwillingly involved through traffic accidents. Many organisations already operate well within the proposed regulations but the standards must be upheld by all cartage operators.