

Accidents in the transport industry

An analysis of available data in respect of
load shift incidents

Prepared by the **Health and Safety Laboratory**
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load shift incidents

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The transport industry has for some time been acknowledged as a relatively dangerous industry. One of the key hazards within the transport sector is posed by loads shifting in transit and then falling from vehicles, causing injuries and/or fatalities. Between 2006 and 2007 HSE identified 5 deaths and over 216 major injuries resulting from objects falling onto people in the 'freight by road' industry. A further 946 people received injuries severe enough to require more than three days absence from work (HSE, 2008). The impact of such incidents are not, however, limited to workers within the industry. A load shifting in transit on the public highways and byways can, and have, killed members of the public.

Whilst the negative outcomes of what can happen when a load shifts are relatively clear, the reasons as to why loads shift is less clear. Whilst inadequacy of securing methods are bound to play a part, this is possibly just the visible part of deeper issues. The aim of this research has been to explore load security issues, identifying causal and contributory factors to loads shifting.

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EXECUTIVE SUMMARY

Introduction

The transport industry has for some time been acknowledged as a relatively dangerous industry (HSE, 2003). One of the key hazards within the transport sector is posed by loads shifting in transit and then falling from vehicles, causing injuries and/or fatalities. Between 2006 and 2007 HSE identified 5 deaths and over 216 major injuries resulting from objects falling onto people in the 'freight by road' industry. A further 946 people received injuries severe enough to require more than three days absence from work (HSE, 2008). The impact of such incidents are not, however, limited to workers within the industry. A load shifting in transit on the public highways and byways can, and have killed members of the public.

Whilst the negative outcomes of what can happen when a load shifts are relatively clear, the reasons as to why loads shift is less clear. Whilst inadequacy of securing methods are bound to play a part, this is possibly just the visible part of deeper issues.

Objectives

The aim of this research was to explore load security issues, identifying causal and contributing factors to loads shifting. This was achieved following the four objectives identified below.

1. Analysis of RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations) data for the transport sector, utilising data mining techniques and thematic analysis. The aim here was to gain a better understanding of the scale and extent of the problem, in addition to uncovering some of the causal and contributing factors to loads shifting.
2. To search for additional data on load security incidents or accidents and conduct appropriate analyses.
3. To gain insight from industry stakeholders on some of the key issues surrounding load security and to identify causal and contributing factors that may lead to loads shifting. Solutions to any problems identified were also sought.
4. To engage employees within the industry to identify causal and contributing factors that may lead to loads shifting. Again, solutions to problems were also sought.

Main Findings

In total four sets of data were used in this research. These included RIDDOR data, police incident reports, stakeholder discussion data, and focus group data from employees working in the industry.

There was acknowledgement in the results that loads often shift due to them not being secured, or being inappropriately secured. Goods being loaded or stacked badly were amongst other reasons for loads shifting. Findings from the four resulting data sets were analysed individually and then distilled into broad factors. These were:

- Lack of safety culture;
- Lack of awareness and education;
- Lack of communication, engagement and standards across the industry;
- Issues with specific loads; and

- Extrinsic and unintentional factors.

Lack of safety culture

The findings illustrated that safety culture within the industry may be relatively poor in some cases. Productivity can easily take priority over safety, and it appears that organisations do not always take corrective actions to ensure that safety takes priority or is at least of equal importance. Complacency of drivers and loading staff was also acknowledged. Less adequate securing methods may be adopted over time due to the perceptions that accidents have not occurred in the past.

Lack of awareness and education

Indeed some of the weaknesses in safety culture may be due to a lack of awareness and knowledge about the risks and/or controls that are available. The results illustrated on several occasions that some workers in the industry may not fully understand the science behind securing loads. An example here is the false assumption that a load will remain in place under its own weight.

Lack of communication, engagement and standards across the industry

The large size of the industry and its international nature creates a number of difficulties. This includes a lack of clear guidance on securing loads and a lack of consistency in regulation (for example different standards adopted throughout Europe).

Issues with specific loads

Transportation of hanging meats and liquids were noted to pose specific load security issues. Hanging meats were suggested to be unstable in some cases due to the swaying motion which may destabilise a vehicle. Similarly it was added that the 'sloshing' motion of liquids can have a similar effect.

Extrinsic and unintentional factors

A number of issues identified that could contribute to, or cause a load to shift were linked to factors that cannot easily be controlled. These included weather conditions, such as rain and ice; and road surface conditions, such as cambers and potholes.

Closing comments

The report acknowledges that improving the safety culture of organisations and increasing awareness and education does, however, carry financial implications. This could act as a barrier to the industry. The need for a 'carrot and stick' approach to achieve changes in behaviour is therefore likely to be essential.

Recommendations

- **Develop and strengthen safety culture within the transport industry**

Consideration of behaviour change strategies are strongly recommended. Such an approach would require a change in behaviour at the top level of the industry (i.e. management). Organisations would need a sufficiently mature safety culture for this, including a shift away from a blame culture to investigating and rectifying underlying organisational factors.

HSE could be actively involved in key parts of a behaviour change approach. For example HSE could be involved in awareness raising activities and providing input to

the necessary components of training courses. Aspects such as the science behind load security could be covered here also.

- **Continued industry consultation and engagement**

The transport industry is not only a large industry but also involves a great number of stakeholders. In relation to regulatory bodies alone, the industry is regulated by HSE, the police and VOSA in the UK. The international nature of the industry and crossing of boundaries throughout Europe and the rest of the world also adds to the complexity of the problem. Engagement across the industry and with key stakeholders is therefore required to ensure that the industry follows standard guidance. Consultation with vehicle designers and manufacturers on incorporating load safety into design could also be considered here.

- **Improving safety of the transport of hanging meats and liquids**

The problems of transporting hanging meats and liquids could be explored in more detail. If the transport of these goods results in a disproportionate number of accidents compared to traditional loads, there may be a need to seek specific solutions to this issue.

- **A quantitative survey to ensure findings are generalisable**

Based on the findings of this largely exploratory and qualitative methodology there is scope for the development of a survey in order to obtain a more generalisable picture of the issues in the industry.

1 INTRODUCTION

1.1 BACKGROUND

The securing of loads in the transport industry is a topic of concern for the Health and Safety Executive (HSE). Between 2006 and 2007 HSE identified 5 deaths and over 216 major injuries resulting from objects falling onto people in the ‘freight by road’ industry. A further 946 people received injuries severe enough to require more than three days absence from work (HSE, 2008). In addition to this, HSE statistics show that that over a period of five years leading up to 2003 a total of 60 employees in the industry were killed and over 5,000 were seriously injured. A further 23,000 suffered injuries severe enough for an over three-day absence (HSE, 2003). The pyramid of harm (Figure 1 below) illustrates these figures, also highlighting that there is likely to be an even greater number of minor injuries and near misses.

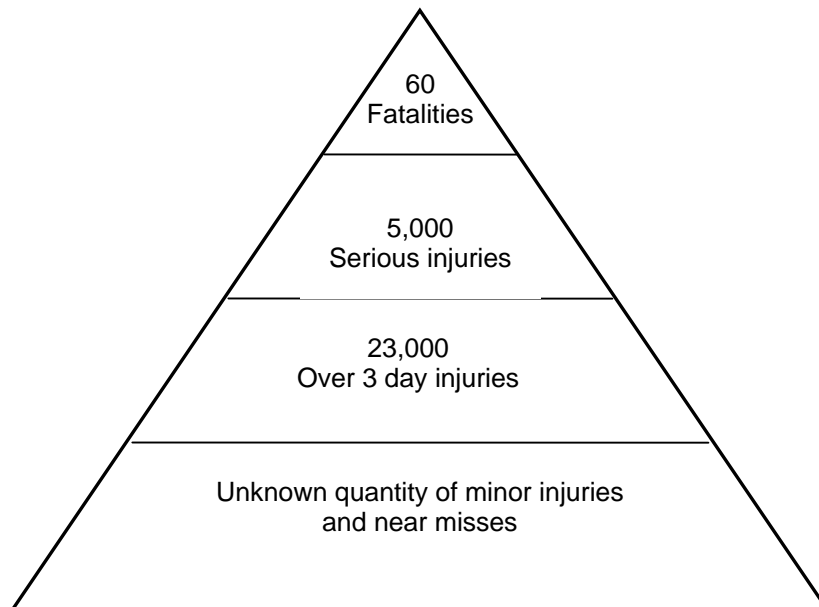


Figure 1: Pyramid of harm for incidents in the haulage and distribution industry between 1999 & 2003.

It is inevitable that the statistics show only part of a much larger picture, with underreporting of incidents likely to be hiding an unknown quantity of accidents. Load security poses a much broader problem to society, with shed loads causing injuries and fatalities not only to those who work in the transport industry but also to the general public. As an example of this the Telegraph newspaper (The Telegraph, 2008) highlighted an incident whereby a lorry shed its load and killed the passenger in a car. In this case, the prosecuting barrister noted that it was “remarkable” that lorry drivers did not receive compulsory training on securing heavy loads. The article also highlighted that the Crown Office raised its concerns over this “defect” in the industry with HSE.

Wider societal issues of shed loads also include traffic jams and road closures. One report identified a load spill causing an 18-mile tailback on the M1 (thisisnottingham.co.uk, 2008). The harm and impact on individuals and society caused by load security issues is therefore relatively clear. It is less clear, however, what the underlying causes are for loads shifting.

Certainly there must be issues relating to loads not being secured correctly or adequately, but it is unclear *why* loads are not being secured appropriately.

1.2 AIMS AND OBJECTIVES

The aim of this research was therefore to explore load security issues in more detail, identifying causal and contributing factors to loads shifting. This included an exploration of issues utilising a variety of strategies. The four objectives below identify how this was achieved.

1.2.1 Objective 1- An analysis of existing RIDDOR data

HSE have access to RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations) data for the transport sector. These data were explored with the application of text mining and targeting to identify cases when a load shifting or falling had led to an accident. When cases relating to load security were isolated, a thorough review was made of the notifier and investigator comments.

1.2.2 Objective 2 - Additional data search and analysis

RIDDOR data have several limitations. For example, they are limited by underreporting of incidents and are likely to omit incidents that occur on public highways. A search was therefore conducted to identify whether any other data existed on loads shifting or falling and causing accidents. Appropriate methods of analysis were applied to additional data identified.

1.2.3 Objective 3 - Consultation with industry stakeholders

There are a number of key stakeholders with an interest or expert knowledge on the topic of load security; for example Trade Unions, Police Forces, the Vehicle and Operator Services Agency (VOSA), and the Highways Agency. These organisations were invited to discuss load security with the research team.

1.2.4 Objective 4 - Consultation with industry employees

The final objective was to consult employees working in the transport industry. The aim was to seek employees' perceptions as to what the contributing and causal factors that lead to loads shifting and causing accidents are. The views of this population were also sought on what the industry can do to improve safety in relation to load security.

1.3 FURTHER READING ON LOAD SECURITY

For further reading on the load security topic please see the following Health & Safety Laboratory report:

Day, N., White, G., & McGillivray, A. (2008). *Load security on curtain-sided lorries*. HSL report ME/08/02.

*	Shift (768)	Mov (1)	Secure (1453)	Load (6903)	Parcel (267)	Pallet (4111)	Case (618)	Strap (1218)	Fall (4769)	Tip (1234)	Struck (2206)	Hit (4902)	Trailer (3781)	Transit (317)
Shift(768)	768	0	58	196	9	148	31	39	125	35	72	102	85	15
Mov(1)	0	1	0	1	0	0	0	0	0	0	0	1	0	0
Secur(1453)	58	0	1453	649	9	192	47	286	305	77	131	233	350	37
Load(6903)	196	1	649	6903	76	1125	150	519	1187	445	585	1027	1479	110
Parcel(267)	9	0	9	76	267	34	6	16	53	2	8	36	31	9
Pallet(4111)	148	0	192	1125	34	4111	114	232	664	113	283	622	541	34
Case(618)	31	0	47	150	6	114	618	19	106	24	66	105	63	7
Strap(1218)	39	0	286	519	16	232	19	1218	370	28	71	171	374	26
Fall(4769)	125	0	305	1187	53	664	106	370	4769	158	248	584	696	54
Tip(1234)	35	0	77	445	2	113	24	28	158	1234	90	173	182	11
Struck(2206)	72	0	131	585	8	283	66	71	248	90	2206	276	251	34
Hit(4902)	102	1	233	1027	36	622	105	171	584	173	276	4902	515	48
Trailer(3781)	85	0	350	1479	31	541	63	374	696	182	251	515	3781	27
Transit(317)	15	0	37	110	9	34	7	26	54	11	34	48	27	317

Table 3: The co-occurrence matrix for the industry specific search terms.

Contributing and underlying factors that were only cited in one case are listed below:

- Removed straps before help arrived
- Movement of another object by a person
- Incorrect stacking
- Incorrect wrapping
- Vehicle repositioned without securing load
- Poor pallet condition
- Spaces/Voids
- Coupling placed in a screw hole
- Vehicle stopping/braking
- Load came off skids
- Poor training of staff
- Load stacked too high
- Load slippery
- Climbing onto the load to correct it
- No system for dealing with shifted loads
- Mixed load (light & heavy goods)
- Not following site procedures

3.3.2.5 Injuries sustained (including fatalities)

The most common type of injury was a break in a bone (see Figure 6), which also included multiple breaks (e.g. a person may have broken a leg and their pelvis). These injuries were identified in 18 cases. Individuals being ‘knocked’ were identified in 12 cases, whilst individuals being knocked unconscious arose 6 times. The classification ‘other severe’ is a RIDDOR classification and accounted for 4 injury types. A total of 3 people were crushed and 2 people were bruised. It is also important to note that 2 fatalities occurred. Cuts, dislocations and fractures were also each cited twice. Individual cases experienced a ‘minor bleed’ and a compression injury.

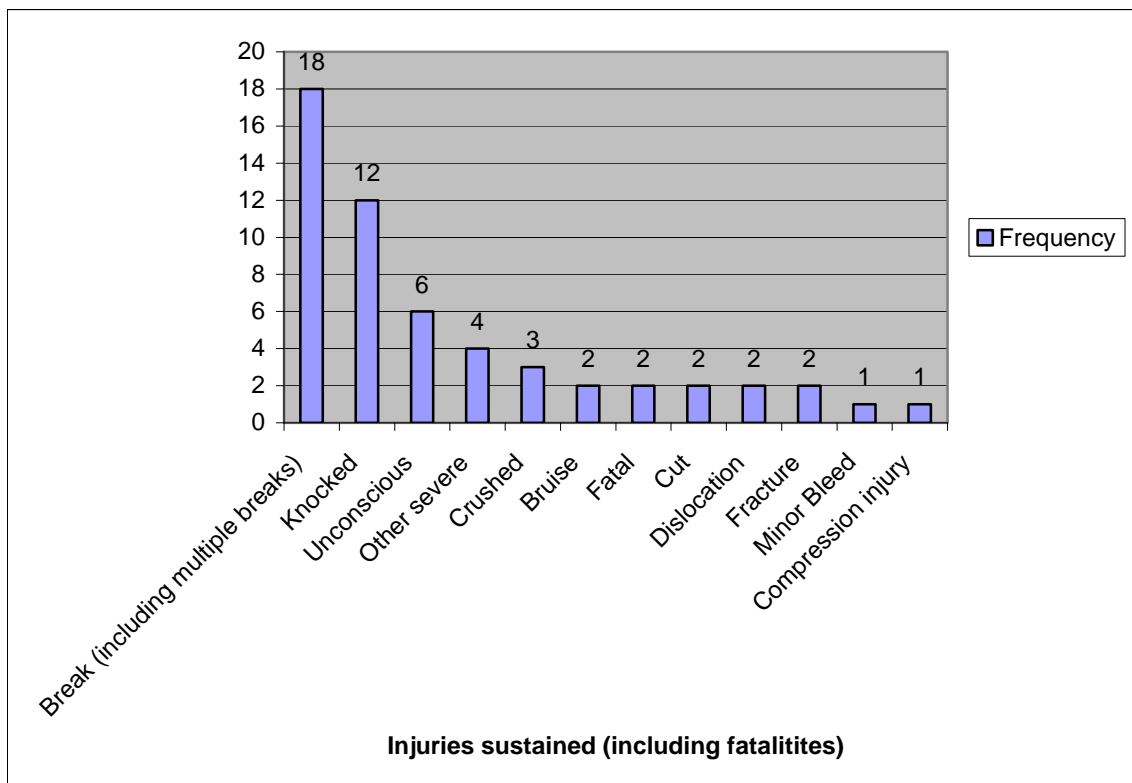


Figure 6: Frequencies of injuries and fatalities.



Photo 2: Another poorly secured load.



Photo 3: A different angle of the vehicle shown in Photo 2 illustrating that the vehicle is also overloaded.

3.5.3 Summary of discussion with a traffic examiner from the Vehicle & Operator Services Agency (VOSA)

Information collected by VOSA

Whilst VOSA collect a range of information when examining vehicles, data are not recorded in a consistent way identifying whether loads on vehicles have shifted. A common reason for vehicles being stopped and checked by VOSA traffic examiners is potential overload cases.

Restraining methods thought to be used in the industry

It was suggested by the interviewee that sheeting and roping were common practices and that straps are commonly used. There was some feeling that flat body vehicles do not usually have loose loads. Cages and pallets were thought to be used regularly, although it was added that often people rely on the weight of the load on a pallet to hold it still.

Factors involved with shifting loads

Speed on corners was identified as a likely factor that would result in loads shifting in transit. It was added that it is also likely for such incidents to occur at intersections and possibly more likely to occur on articulated vehicles.

It was added that shipping containers can hold unevenly distributed loads, which drivers may not be aware of. When such containers are then loaded onto vehicles, there may be a greater risk of an incident such as an overturn.

Transportation of hanging meats was identified as another factor that could cause a problem. As meats are hung from the ceiling of lorries there is potential for them to slide forwards on the supporting rails. This could for example shift the weight of the load to a particular part of the vehicle. This may then overload one of the axles.

The condition of vehicles was noted to play a part in loads shifting. For example it was identified by the interviewee that the anchor points in vehicles are sometimes damaged. This can prevent drivers or loading staff from safely securing items, even when the intention to secure a load is present.

A lack of training was identified as another potential issue. It was suggested that there are a variety of training courses available, but these may be aimed primarily at drivers. This was perceived as a problem, as drivers are often not involved in the loading of vehicles. It was added that a large part of the problem may lie with third party loaders, where training might not be as good. The interviewee suggested that this may include organisations that do not have transport managers.

Finally, vehicles being badly loaded was noted as another potential cause of loads shifting, which could lead to an accident.

The interviewee added that whilst one of the above factors in isolation may not cause a load to shift, a combination of factors would be more likely to result in a load shifting.

Possible solutions

- Use of specialist vehicles for certain loads, for example trailers with wells for transporting paper reels.
- Drivers to use weigh bridges more regularly to check if their vehicles are overweight.
- Better provision of training, advice and support to drivers on correct loading, with the potential for VOSA to be involved with this.

pallet. It was noted that the load can then slide off the pallet. It was explained that often two pallets might be stacked one on top of the other and then the two shrink-wrapped together. This was perceived to be a problem in some cases with the potential for it to shift in transit. In addition it was added that sometimes not enough shrink-wrapping is used. Some participants suggested that goods should be wrapped twice.

There were some issues identified with securing devices. It was noted that in some cases when straps are used, they are not tightened up enough.

'...straps are not strapped strong enough to hold the dollies in, and they role out across the floor.'

Storage of locking bars when not in use was also thought to be a problem. An incident was identified whereby a locking bar could have caused an accident:

'Obviously rolling around the trailer [a locking bar] and one came through the back of the shutter door. It didn't go out into the road but it pierced the door.'

It was explained that in many cases, drivers are not directly involved in loading vehicles and that it is not easy to check if a load is secure:

'Well for the drivers it would be badly loaded trailers because they don't get a chance to see what is in the trailer. It is down to somebody else's discretion to make sure that trailer is loaded correctly and distributed correctly.'

There were some specific problems identified with curtain sided vehicles. It was noted that in some cases, cages are not secured on curtain sided vehicles, with some individuals believing that the curtains are load bearing. It was added that there was some general concern that straps are not used on curtain sided vehicles:

'They don't open the curtains anyway, so they have got no intention of putting straps on'

'With curtain siders to get the straps on obviously there is nothing on the sides for strapping to. To get the straps on you have to have the curtains open. So they shouldn't be being loaded really on the loading bay'

'It's like you see some of these foreign drivers and I hate to pick on the foreign lads but you see the size of the, especially with the curtains you see, there must be about you know an elephant trying to bust through the curtain and yet they are still tootling along quite happily while this is happening.'

3.7.3.3 External influencing factors

Across a number of the focus groups there was some frustration with regards to other road users. A number of drivers explained that other vehicles will often 'cut up' lorries or pull into braking spaces. This can then lead to lorry drivers needing to brake harshly or swerve.

'Same at junctions obviously we have to swing round wide, left hand turn. You still get the idiots coming in trying to cut down the left hand side to try and turn left as well when we have actually got to swing out to turn the trailer round.'

'Because every time somebody cuts in front of you, you back off, you're saying like I've got 25 tonnes on, it's steel, right I'll back off and give myself that braking distance and then that will fit somebody else in, I mean we do our best and it's like, it is down to other drivers cutting you up and you have to do an erratic action and swerve or something like that and which causes a load to shift.'

'I was approaching an island, all the traffic going round this side of the road was completely stopped, there is only one clear route through the island which is the way I am going and as I went round the

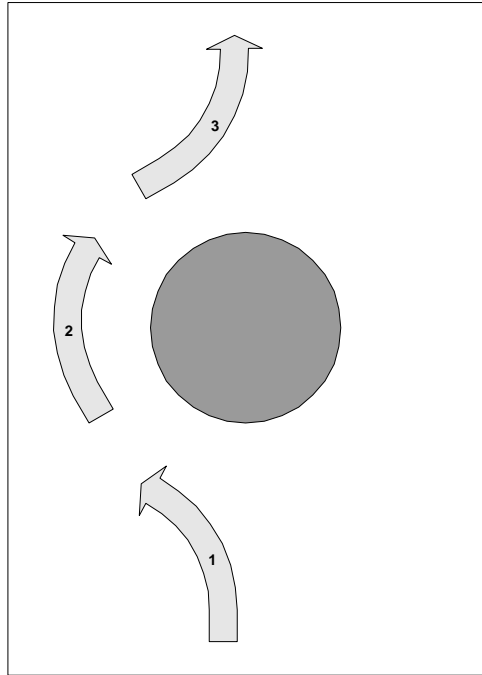


Figure 16: The three key turns a driver may make at a roundabout

3.7.5.4 Influence of external factors

Participants identified that some external influences can impact on loads moving. This included containers being carried in rough seas, which may unsettle the load. It was added that crane drivers lifting containers from ships and onto lorries may also not take enough care and could unsettle a load. There was also some feeling that when trailers collected from other parties there can be a greater chance that the loads within them are not secured appropriately. One participant summed this up:

'It is already closed [the trailer] he doesn't know what is on the back of it. That is when we find it is very poorly loaded.'

3.7.5.5 Loading goods on an icy trailer

A participant from one organisation highlighted an incident whereby steel sheeting had been loaded onto a trailer after a heavy frost. When the driver arrived to collect the load he strapped it down, but was unaware of the heavy frost under the load. When turning a corner the vehicle shed the load.

3.7.6 Handling suspected load shifts

There was some concern from participants that there is often no way to tell if a load has shifted until the trailer/container is opened up. A strategy sometimes employed was simply to open the door slowly to see if anything has moved.

'You can't find out until you open the door. There is no way of seeing anything until the door is open or curtain.'

'And so if something has gone, you have got to open that door very cautiously but then again 9 out of 10 they are all safe'

'If you start opening the doors you can see if they are going to fall out because they are leaning up against the doors.'

than full time and/or British staff. It was added that in relation to training on load security that there is a need to have standardisation across the industry.

Participants at one organisation identified that they had conducted tests on strapping techniques to identify which were most effective for certain loads.

3.7.8 Difficulties and barriers to working safely and securing loads

3.7.8.1 Problems with straps

Across a number of the focus groups it was identified that problems can exist with usage of straps. It was identified that there is not always a good supply of straps. It was added that straps have often gone missing or are damaged when lorries return from making deliveries. It was also explained that sometimes unloading staff may simply cut straps to release a load. There can therefore be a shortage of straps in some cases.

3.7.8.2 Time pressure

Some participants discussed how the pressure to get a vehicle loaded as quickly as possible can lead to corners being cut and goods not loaded as securely as they could be.

'We only actually strap the back two. Across the back. Personally I don't consider it good practice but we go through 350 wagons a day... to strap every pallet would be horrendous.'

The time pressures workers face were also noted to impact on poorly secured loads not being turned away by delivery sites.

'Very rare do we refuse a load like I say because once you have started to pin it in process and you are going to spend 3 hours taking it back up the road for them just to rough or feed boxes round which we could have ruffled around really.'

Reporting of near misses was also noted to be limited due to time pressures. One participant explained that it was easier not to report near misses due to the paper work.

'People won't do it because it is paperwork.'

3.7.8.3 Difficulty checking security of loads

A number of drivers added that they do not usually check the security of a load in a sealed trailer. It was explained that it can cause too much hassle to check a sealed lorry, whilst even when the lorry is not sealed, it was not easy to check how secure an entire load was by looking through the back doors.

'...causes so much agro you don't want to do it.'

3.7.8.4 Problems with standardisation

It was explained that loads can be difficult to 'square up' due to the lack of standard sized cages. It was noted that the cost to standardise cages would probably be too high. There was also a perception that there is no standardised industry guidance on how loads should be secured.

'You are a driver you wouldn't believe what we have to do to secure the load. They come up with a standard way of doing it, we use bars. We don't use ratchet straps. We are not allowed to use ratchet straps. And you think why don't we just have a standard across the board'

3.8 TRIANGULATION OF DATA SOURCES

Table 5* provides an illustration of the contributing factors that may lead to a load shifting and which data sources they emerged from.

Table 5: Triangulation between potential causes/contributing factors to load shifts and the data sources.

Potential causes/contributing factors to load shifts	RIDDOR Data	Police Data	Stakeholder Data	Employee Data
Load not secured/incorrectly secured	X	X	X	X
Turning a corner or at a roundabout	X	X	X	X
Heavy/harsh braking	X	X	X	X
Spaces/Voids	X		X	X
Poor or no training for staff	X		X	X
Driving too fast		X	X	X
Weather conditions impacting on visibility (e.g. fog)		X	X	X
Badly loaded goods	X		X	
Incorrect/poor stacking	X			X
Incorrect/poor wrapping	X			X
Vehicle repositioned without securing load or with doors open	X			X
Mixed loads (stacking heavy goods on light goods)	X			X
Not following procedures	X	X		
Hitting a kerb		X		X
Time and cost pressures (including the incentive to work quickly)			X	X
Unable to check loads (including sealed loads)			X	X
Complacency with inadequate securing			X	X
Vehicles transported in rough seas			X	X
Weather conditions impacting on road surface (e.g. wet, greasy, icy, snow covered)			X	X
Perceived lack of consistency in guidance and regulations			X	X
Transporting hanging meats			X	X
Road surfaces (e.g. potholes, cambers, and tram lines)	X			X
Shifted when strap released	X			
Uneven surface (vehicle tilted)	X			
Removal of straps before checking load	X			
Support/safety bar removed	X			
Skip uncovered	X			

* The colour coding has been adopted here as a means of illustrating the number of times the potential causes/contributing factors arose from the different data sources, with red showing the clearest links.

Accidents in the transport industry

An analysis of available data in respect of load shift incidents

The transport industry has for some time been acknowledged as a relatively dangerous industry. One of the key hazards within the transport sector is posed by loads shifting in transit and then falling from vehicles, causing injuries and/or fatalities. Between 2006 and 2007 HSE identified 5 deaths and over 216 major injuries resulting from objects falling onto people in the 'freight by road' industry. A further 946 people received injuries severe enough to require more than three days absence from work (HSE, 2008). The impact of such incidents are not, however, limited to workers within the industry. A load shifting in transit on the public highways and byways can, and have, killed members of the public.

Whilst the negative outcomes of what can happen when a load shifts are relatively clear, the reasons as to why loads shift is less clear. Whilst inadequacy of securing methods are bound to play a part, this is possibly just the visible part of deeper issues. The aim of this research has been to explore load security issues, identifying causal and contributory factors to loads shifting.

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