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Access to and work on flatbed vehicles

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Flatbed vehicles are widely used to transport many types of goods on the road. They offer advantages over closed vehicles in terms of easy access to the load bed for loading and unloading and versatility of use.

A number of fatal or major incidents are reported to HSE and local authorities where drivers, members of the public, or site personnel have been injured during the loading and unloading of these vehicles.

This report describes a multi-disciplinary, mixed-method approach to research on this topic, comprising both quantitative and qualitative analysis, undertaken to establish contributory factors to incidents and areas of concern when accessing or working on flatbed vehicles.

It is intended that this work will help to inform industry stakeholders in developing updated guidance on safe delivery using flatbed vehicles.

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HSE Books

Access to and work on flatbed vehicles

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KEY MESSAGES

- Load handling and slips, trips, and falls were identified as primary contributory factors in incidents involving flatbed heavy goods vehicles (HGVs).

- Ground-level working when loading and securing was identified as being strongly preferred by both drivers and sites. Appropriate risk control measures including the provision of suitable equipment to allow loading, securing, and unloading to be carried out safely from ground level could reduce the risk of injury, particularly when dealing with irregular loads that may otherwise be difficult to safely load and unload.

- Loose packaging, such as loose or damaged banding or inadequate shrink-wrapping, could create a trip hazard on the load bed and result in drivers falling on or from the vehicle. Identifying and fixing poor wrapping before loading could reduce the risk of a fall on or from the vehicle.

- Inclement weather, including wet or icy conditions, and low or poor light conditions, could increase the risk of accessing and working on the load bed.

- Inadequate packaging for fragile or crushable load items could result in product spill or damage, particularly when webbing straps are used to secure the load, creating a slip or trip hazard on the load bed. Using alternative securing methods such as nets or sheets or using more substantial packaging could reduce the risk of damage.

- Voids in the load and poor load stacking could result in unstable loads liable to collapse either in transit or during unloading. Filling voids in the load could prevent unintentional load movement.

- Inadequate load securing could result in the load moving in transit, creating a slip or trip hazard on the load bed. Drivers had good awareness of the risks of muscular-skeletal disorders (MSDs) and falls from heights, however there was less awareness of the risks of load movement in transit and the importance of load securing. Additional training and information could help drivers secure their loads to prevent unintentional movement in transit.

- Where ground-level working is not practicable, measures such as edge guarding and lanyard systems could be considered instead.

- Communication and information shared between the supplier and delivery sites can help to reduce loading and unloading delays if suitable safety equipment is not available. Good site management to allow drivers a safe area away from moving vehicles in which to secure and check their loads was perceived to be helpful.

EXECUTIVE SUMMARY

BACKGROUND

Flatbed heavy goods vehicles (HGVs) are widely used to transport many types of goods on the road. They offer advantages over closed vehicles in terms of easy access to the load bed for loading and unloading and versatility. However, every year a number of fatal or major incidents are reported to HSE and local authorities where drivers, members of the public, or site personnel have been injured during the loading and unloading of these vehicles.

Specialists at HSL: HSE's Health & Safety Laboratory in Buxton carried out a study to explore the factors contributing to incidents while accessing and working on flatbed vehicles. It is intended that this work will help to inform industry stakeholders in developing updated guidance on safe delivery using flatbed vehicles.

RESEARCH AIM

The aim of the research was to establish contributory factors to incidents and areas of concern when accessing or working on flatbed vehicles, and to suggest areas where improvements may be practicably made.

METHODOLOGY

A multi-disciplinary mixed-method approach comprising both quantitative and qualitative analysis was undertaken to establish contributory factors to incidents and areas of concern when accessing or working on flatbed vehicles. By combining quantitative data (RIDDOR data) and qualitative data (interviews and site visits), an overall picture of common areas of concern could be obtained.

Ergonomic and engineering reviews were carried out to identify existing research on issues relating to flatbed vehicles, and equipment and other measures used to control previously identified risks, in conjunction with an analysis of RIDDOR data over the period 2008/09 to 2012/13 to identify contributory factors to incidents. A total of 182 relevant incidents over this period were analysed.

Ten HGV drivers were consulted during a series of roadside enforcement checks carried out by three police forces. Eleven HGV drivers and seven site managers were also consulted during a series of visits to seven sites where loading and/or unloading of flatbed vehicles was carried out. The purpose of these consultations was to assess and evaluate the suitability of systems commercially available for preventing falls from vehicles and the extent to which load packaging and loading practice contributes to workplace incidents.

RESULTS

Contributory Factors to Incidents

The RIDDOR analysis indicated that the two primary contributory factors to incidents while working on the load bed were load handling, and slips, trips, and falls. Driver and site manager consultation responses were consistent with this, with drivers in particular describing a number of situations where they could be at risk of falling on or from the load bed. These situations included:

- Working in low/poor light conditions, creating a risk of the driver inadvertently stepping off the load bed

- Loose banding and/or packaging creating a trip hazard on the load bed

- Wet or icy weather conditions creating a slip hazard on the load bed

- Pallet collapse due to poor maintenance/overloading, stack collapse due to poor loading and load securing, or stack movement due to poor shrink-wrapping or banding, creating a trip hazard on the load bed, and a risk of falling if an unstable load suddenly toppled

- Inadequate packaging becoming damaged by load securing equipment, leading to product spill creating a slip hazard on the load bed

Examples of poor loading included substantial voids left between items in the load, and pallets of unequal heights being placed next to one another so that a webbing strap used for securing did not adequately secure the smaller pallet.

HGV drivers consulted for the research appeared to have a good understanding of the risks of muscular-skeletal disorders (MSDs) and falls from vehicles. Most had received specific training and information on these issues and were generally positive about systems put in place by their employer and/or other companies they dealt with to reduce the risk of injury.

However, there was less awareness of the issues surrounding the loading, packaging, and securing of loads, particularly in relation to the use and maintenance of webbing ratchet straps, which are commonly used in road haulage to secure a wide variety of loads. While drivers were often involved in directing the loading of their vehicles, and carried out the securing of the load, they had not received the same level of information and training as they had for MSDs and falls, and were not always aware of how the loads they carried could best be secured.

Access to vehicles

The majority of drivers consulted stated that their employers and/or the sites they collected from, or delivered to, had policies to prevent drivers working on the load bed and systems in place to load and secure from either ground level or from working platforms/gantries. They also confirmed their clear preference for ground level working.

Both drivers and site managers noted that access equipment could introduce several issues, which included:

- Access equipment available at a supplier site might not be available at subsequent delivery site/s

- Access equipment not always adequately maintained, and gantries vulnerable to impacts from HGVs and fork lift trucks

- Wet or icy conditions could result in a slip hazard

Fall prevention/protection

Removing the risk of working at height by working from ground level was strongly favoured by both drivers and site managers, with suitable equipment being provided to drivers to enable them to sheet and/or secure their loads without accessing the load bed. Reasons given for this approach included:

- History of slips/falls
- Customer demand (customer policy not to allow working at height on their sites)
- Specific equipment (such as suspended nets or automated sheeting) improved loading times
- Specific equipment reduced risk of MSDs to drivers

While there are myriad commercial systems available for providing fall prevention/protection on flatbed vehicles, the preference of those consulted for the research appeared to be for ground-level working wherever possible.

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1. INTRODUCTION

1.1 BACKGROUND

Flatbed vehicles are widely used to transport many types of goods on the road. They offer advantages over closed vehicles in terms of easy access to the load bed for loading and unloading and versatility. However, every year a number of fatal or major incidents are reported to the Health and Safety Executive (HSE) and local authorities where drivers, members of the public, or site personnel have been injured during the loading and unloading of these vehicles.

Injuries resulting from loading and unloading incidents may occur through a combination of factors. This project aimed to assess the effect and interaction of load securing (method and application), placement and packaging of goods (method and application), working at height, manual handling, and ergonomic issues, and identify potential areas of improvement and best practice. Industry stakeholders identified the transport of goods on flatbed vehicles, the loading and securing of those goods, and working at height as key issues to resolve in order to reduce both the number of incidents and damage to goods, vehicles, and site infrastructure.

Specialists at HSL: HSE's Health & Safety Laboratory carried out a study to explore the factors contributing to incidents while accessing and working on flatbed vehicles. It is intended that this work will help to inform industry stakeholders in developing updated guidance on safe delivery using flatbeds.

1.2 IMPLICATIONS

In recent years there has been a clear trend in industry of discouraging drivers from accessing the load bed of a flatbed vehicle, either by providing equipment that allows loading and securing to be carried out from ground level, or providing gantries or walkways at height so that drivers are not working on the load bed itself. The use of automated sheeting systems and securing systems that can be applied from ground level help to reduce the risk of falls from the load bed as well as muscular-skeletal disorders.

Pro-active communication and a positive safety culture within companies, coupled with effective driver training, can help engage drivers in using equipment provided to them to reduce the risk of falls. Communication and clear expectations between supplier and delivery sites can also help to ensure that equipment and procedures are in place to unload vehicles safely.

2. METHODOLOGY

A mixed-method approach comprising both quantitative and qualitative analysis was undertaken to establish contributory factors to incidents and areas of concern when accessing or working on flatbed vehicles. By combining quantitative data (RIDDOR data) and qualitative data (interviews and site visits), an overall picture could be obtained.

Ergonomic and engineering reviews were carried out to identify existing research on issues relating to flatbed vehicles, and equipment and other measures used to control the identified risks, in conjunction with an analysis of RIDDOR data over the period 2008/09 to 2012/13.

HGV drivers were consulted during a series of roadside enforcement checks carried out by three police forces. Drivers and site managers were also consulted during a series of visits to sites where loading and/or unloading of flatbed vehicles was carried out. The purpose of these consultations was to assess and evaluate the suitability of systems commercially available for preventing falls from vehicles and assess the extent to which load packaging contributes to workplace incidents, specifically incidents where:

1. Packaging fails and workers have to access the vehicle bed to remove or sort products;

2. Packaging has failed during transport and products fall from the vehicle when workers try to access the products for unloading;

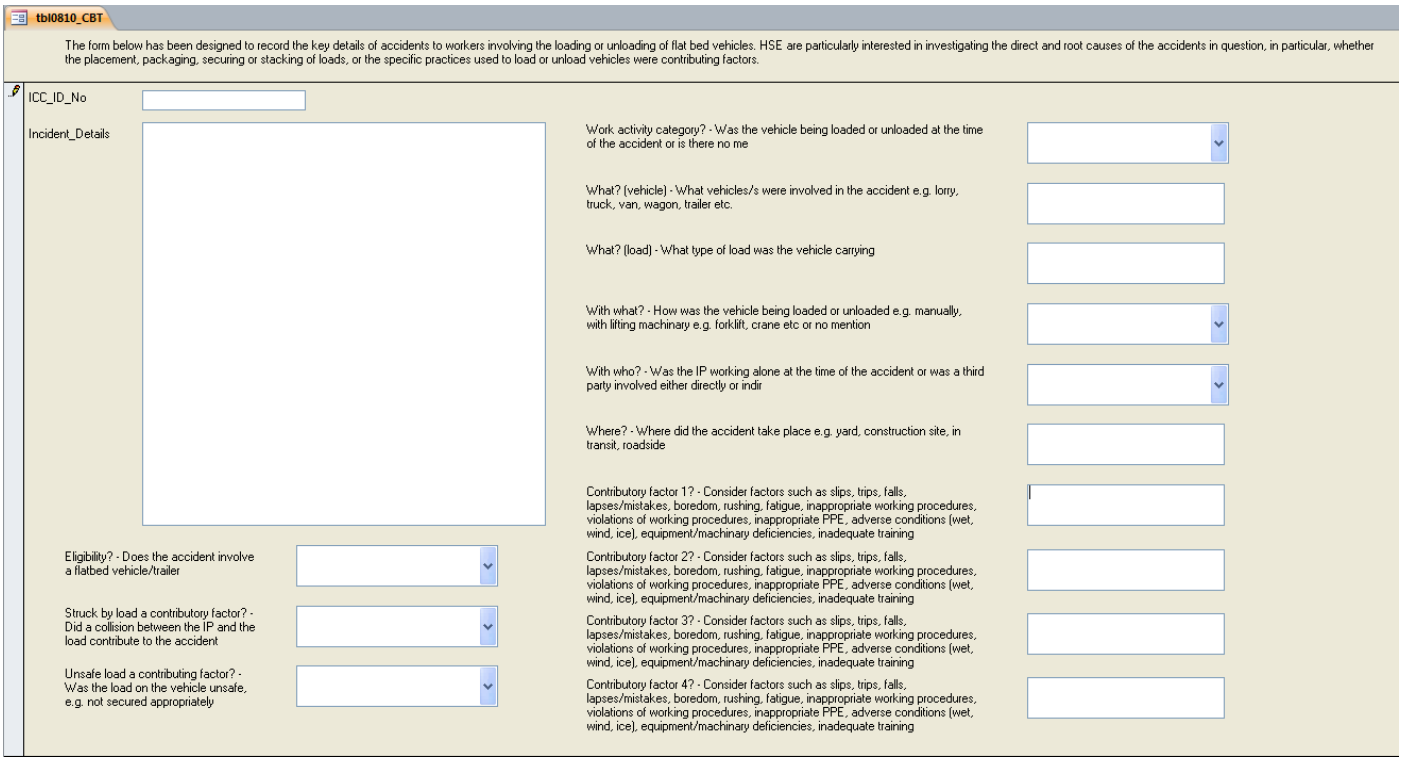
3. Packaging has been damaged during loading and unloading, and products are unstable when workers go to unwrap them.

4. Products do not come with any weights or storage instructions.

3. RIDDOR ANALYSIS

A review was carried out of incidents reported to HSE over the period 2008/09 to 2012/13 using the search term 'flatbed and loading or unloading'. 182 relevant incidents were identified over this period. The incident review form used to identify and classify incidents is shown below in Figure 1:

Figure 1 – Incident review form



Just over half of incidents (52.7%) occurred during loading. 70% of incidents occurred when the injured person (IP) was working alone.

Analysis of the incident reports indicated that there were five stated contributory factors: load handling (including injuries caused by the load itself), slip, trip or fall (including falls from the load bed), machinery or equipment failure, environmental conditions, and the involvement of a third party. The distribution of these contributory factors is shown in Chart 1 on the following page. Injuries involving the load and slips, trips, and falls were the most common contributory factors to reportable injury incidents.

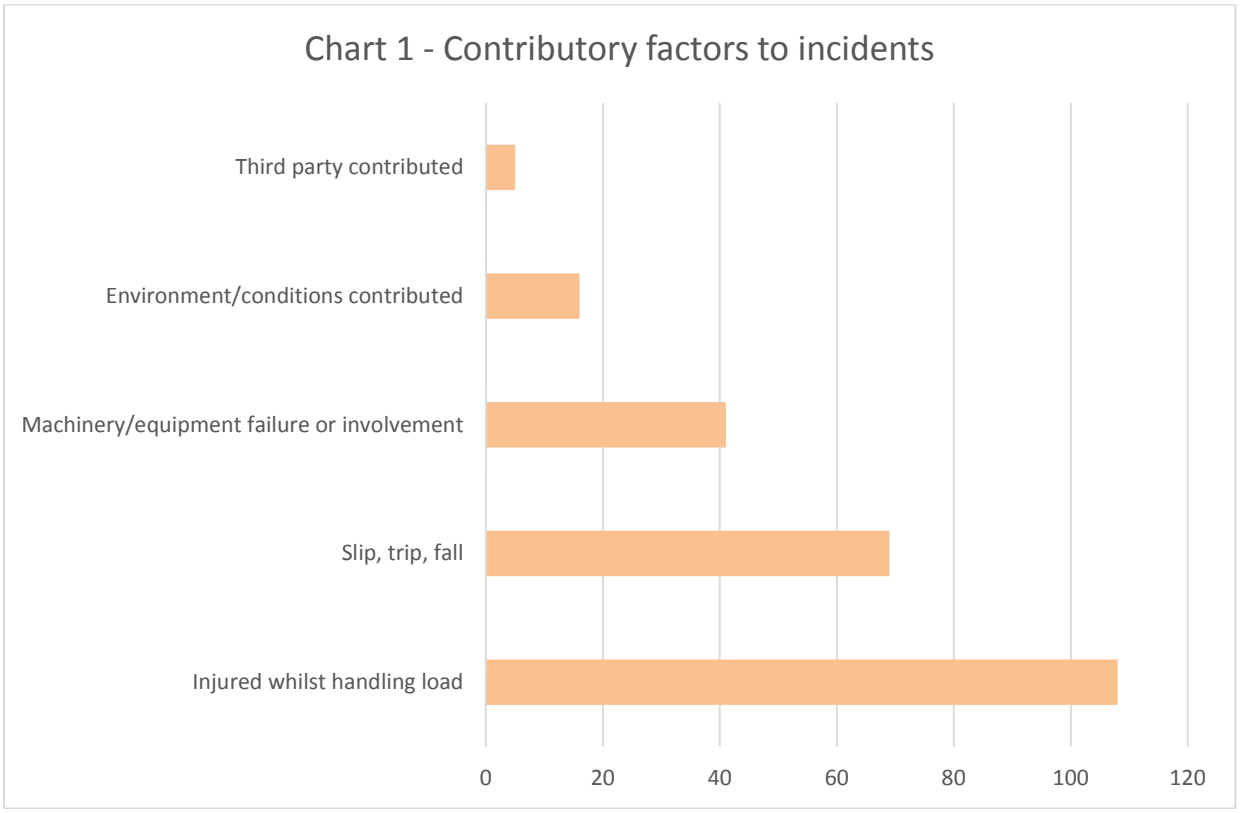


Chart 1 - Contributory factors to incidents
Third party contributed
Environment/conditions contributed
Machinery/equipment failure or involvement
Slip, trip, fall
Injured whilst handling load
0
20
40
60
80
100
120

4. LITERATURE REVIEWS

4.1 ERGONOMIC REVIEW

A review of the literature and guidance relating to access to and work on flatbed vehicles was carried out by HSE ergonomists. The review aimed to address the following issues:

- Actions and tasks involved in loading and loading flatbed vehicles
- Ergonomic issues associated with these tasks and the environment that they are carried out in

A search of relevant databases and the internet was undertaken using with the assistance of HSE's Information Services Search Team using search terms reflecting the issues above.

Methodology

The databases and internet were searched using combinations of the following key words:

Table 1: Combination of keywords for search terms

Vehicle	*AND*	*Task / Hazard*
Flatbed or flat bed		Loading / Unloading
Trailer		Manual handling
Lorry		Falls from height
Drop-deck		Slips / trips
Step-downs		Occupational injuries (non-traffic)
Low loader		Musculoskeletal disorders
Car carrier		Falls from vehicles
Tarping / Sheeting systems		Access / Egress
Heavy Goods Vehicles		Load securing / restraint
		Load stability
		Sheeting / Tarping

The search was limited to literature published after 1998. The results obtained are shown in Table 2

Table 2: Search results from HSE Search Team

Database	*Search results*
Oshrom	1
Web of knowledge	13
NTIS and Compendex on Proquest	4
Ergonomics Abstracts	15
Science Direct	3
Healsafe (on STN)	0
TRIS and MIRA (on Dialog)	6
Total search results	42

In addition to these 42 results, a further 8 were found in the web-based search. Of these 50 search results abstracts, 19 were excluded as not relevant to the issue due to not concerning commercial goods vehicles or non-traffic, occupational injuries. The 31 articles which were considered to be possibly relevant were sourced and reviewed by one researcher. A data extraction sheet was completed for each article reviewed covering the following issues: action or task, falls, slips/trips, manual handling, environmental factors, suggested solutions/recommendation or guidance, and additional relevant issues. From this data extraction sheet a summary of the key ergonomic issues concerning flatbed vehicle loading was compiled and is shown in Table 3:

Table 3 Key ergonomics issues from literature review concerning loading/unloading of flatbed vehicles

	Action/task	*Hazard*	*Factors increasing risk or level of harm*	*Suggested controls/ good practice*
1	**Climbing on/off trailer or load**	-Falls from vehicle or load [1-5] -Slips, trips, falls when using access system[5] -Jumping down from back of trailer leading to MSDs (back, lower limbs)[6-9]	**Vehicle:** -***No or inadequate steps/ladder to access trailer***[6, 7, 10] --climbing on/off using side bars, tyres, holding on to load or strapping --jumping down from trailer -***Poor design of steps/ladder*** [1, 5, 10] --high first step, irregular differences between steps, narrow treads, not slip resistant surfaces, no or poor hand rails or hand holds ***-Poor condition of steps/ladder***[1, 5, 10] -slippery surfaces on steps/load area e.g. due to surface contamination (diesel, oil residues) -worn surfaces -broken **Behaviour:**[5, 6, 10] -Not using steps/ladders when available – jumping down from trailer -Not wearing footwear with sufficient grip **Environment:**[1, 6, 10] -Icy, wet, conditions – slippery ground, steps, load -uneven ground around trailer	**Vehicle**:[1, 2, 6, 7, 10] -design vehicles with adequate access provision to trailer -provide substantial fold-out steps at back and/or side with suitable hand holds -provide portable ladder with 3 point support -Improve cleaning and maintenance of vehicle **Training**[6, 10] -Encourage drivers to use steps and grab rails -driver training on access systems and risk awareness
2	**Working on top of trailer or load** -On top of load - On load bed	-Falls from load[1, 2, 4, 5] -Falls from trailer load bed[1, 4, 5, 9, 11, 12] -Slips, trips[12]	**Load:**[1, 2, 9-13] -height of load (e.g. double stacked) -uneven load surface -voids in loads (especially if not seen as under sheeting) -Blown off in windy conditions -Knocked off by load moving -Slippery surface on load (e.g. slippery packaging, oil residues)	**Load:**[2] -shippers to place loads: symmetrically; as low as possible; with no gaps/voids between **Load bed:**[10-13] -improve maintenance and

	Action/task	*Hazard*	*Factors increasing risk or level of harm*	*Suggested controls/ good practice*
			especially in wet/icy conditions -Tripping hazards on parts of load, load packaging, securing straps, sheeting **Load bed:**[1, 2, 9-13] -Slips on smooth steel edges of flat bed -Falls off due to lack of awareness of where edges are (stepping back into air) -Trips or slips due to poor condition of load bed, e.g. broken/ rotten planks, protruding nails, algae, oil residues from steel loads -Equipment (e.g. straps, ropes) breaking during use due to poor condition -Trips and slips due to load straps/ ropes, slippery plastic, shrink wrapping, raised lip along edges of some trailers, protruding (non-retracting) fastening clips **Environment:**[1, 2, 10, 12] -Windy conditions – risk of being blown off load or trailer. -Icy/ wet conditions – increased risk of slipping on load or load bed	housekeeping of trailers -contrasting edging on trailer to increase noticeability of edges **Behaviour:**[1, 2, 5, 10, 13] -Remove need for driver to access load/load bed e.g. load, sheet, secure from ground -use fall protection system -use slip resistant footwear -wear hard hat with chin strap **Environment:**[10] -load/unload under cover where possible
3	**Loading/unloading**	-MSDs from manual handling of loads[8, 10, 14-17] -slips, trips, falls when loading/unloading[14] -struck by/ collided with/ caught between injuries whilst loading/unloading[2, 9, 10, 13, 14, 16]	**Loads:**[8, 11, 13, 14, 16, 18, 19] -Manual handling heavy loads -high frequency lifting/carrying/ pushing/pulling -manual handling with awkward postures adopted (twisted, bent, constrained by space) -Use of strapping on loads to move/adjust loads (can give way causing overbalancing and falls) -Loss of control of loads -Being caught between , struck by or colliding with parts of the load or the trailer (or other objects) e.g. side boards dropping down -Working on load or load bed during FLT loading/unloading	**Loading/unloading:**[10, 18, 19] -crane loading/unloading[10] -vehicle mounted crane -use belt loader -general improvements in loading/unloading -availability of lifting equipment **Behaviour:**[11] -reinforcement of safety

	Action/task	*Hazard*	*Factors increasing risk or level of harm*	*Suggested controls/ good practice*
			Loads moving on load bed:[9, 10] **-**Injuries from loads falling on drivers when loading/unloading (with driver working from ground or from load bed) -Falls from height if knocked off load bed by falling load **Environment:**[9, 10, 12] -increased risk of slips and falls when loading/unloading outside in icy/wet conditions –either from load, load bed or ground around trailer	procedures -use lifting equipment when it is provided - wear hard hat with chin strap -use slip resistant footwear -safety training
4	**Manual sheeting of loads**	Manual handling – risk of MSDs: -Lifting sheet to the top of the load[1, 2, 20] -Unfolding sheet over load[1, 2, 20] -Pulling sheet across load from ground[1, 2, 20] -Strapping down sheet[1, 8, 20] -Slips, trips and falls when sheeting[9, 11, 20]	**Manual handling:**[1, 2, 9, 20] -Risk of MSDs from manually lifting heavy tarpaulin on to top of load -Risk of MSDs whilst unfolding sheet when on top of load (bent, twisted postures, heavy sheet). -High pull forces and awkward postures adopted when pulling sheeting over load (e.g. stooping, leaning backwards, twisting whilst pulling) increase risk of MSDs especially to back **Falls:** (as for working on load/load bed)[1, 11, 20] -Especially where the load is oddly shaped – may need to access trailer/ load more often to get sheet over load **Environment:**[1, 2, 9, 10] -Increased risk of falls if manually sheeting in high wind as risk of wind catching sheet and being blown off	**Reduce sheeting:**[1, 2, 11] -Reduce sheeting of flatbeds where possible **Reduce manual sheeting:**[2, 9, 11] -use mechanical sheeting devices (develop for flatbeds) -use side kits, curtain sides, overhead crane **Reduce slips/falls risk:**[2, 9-11] -sheet from ground -sheet from platforms, -use gantries and fall protection -Reduce-provision of covered loading/ sheeting/ securing bays/docks -use slip resistant footwear **Reduce manual handling:**[2]**-** **-**use lightweight nets or

	Action/task	*Hazard*	*Factors increasing risk or level of harm*	*Suggested controls/ good practice*
				sheets -use FLT or cranes to lift sheet on top of load
5	**Strapping/securing load**	-Throwing straps over loads[20] -Tensioning straps[9]	-Risk of MSDs of upper limbs with repetitive throwing of heavy ropes/straps. Especially over high, large or awkward shaped loads[1, 3, 17] -Risk of MSDs of upper limbs when tensioning straps if this action requires high forces to be exerted and/or repetitive actions of upper limbs[17, 21] -loads moving during strapping (e.g. straw, hay)may cause struck by injuries[9, 22] -Slips, trips and falls when working around or on trailer especially where ground is uneven and/or in icy/wet conditions[2, 10] -Increased risk of falls if need to access trailer to free straps caught on awkward load or to adjust straps[2]	
6	**Moving around vehicle at ground**	Slips, trips, falls during loading/ sheeting/ securing loads from	-Increased risk if working:[10, 13, 17] -- on uneven ground	-Improve lighting in loading areas[10, 13]

	Action/task	*Hazard*	*Factors increasing risk or level of harm*	*Suggested controls/ good practice*
	level	ground[10, 13, 17]	--in poor lighting conditions in load areas --on slippery platforms, ramps, docks --in icy/wet conditions	-Improve flooring[10] -use slip resistant footwear -load, sheet and secure under cover if possible[10]
7	**All tasks**	-Tight schedules[10, 11, 15] -Strenuous activity following long periods of driving[8, 21] -Fatigue[1, 10]	-Literature suggests that sometimes schedule demands prioritised over H&S e.g. not waiting for platform / gantry to become available before sheeting [10, 11] -haste, -pressure of "just in time" systems[10, 19] -Increased risk of MSDs if strenuous activity (e.g. climbing on/off trailer, unloading) is carried out after prolonged sitting (driving)[8, 21] -tiredness due to lack of quality sleep increases risk of accidents e.g. due to a loss of concentration[1, 10, 15]	

4.2 ENGINEERING REVIEW

4.2.1 Initial search

An internet search was carried out to identify commercially-available fall prevention and fall protection systems that could be used to protect drivers and site workers involved in the loading and unloading of flatbed vehicles, using the search terms described in Section 4.1.

102 systems were identified, of which 8% were not specifically marketed towards the transport industry but could be used for vehicle loading and unloading. These systems were primarily lanyard fall arrest systems mounted on an overhead crane or post-mounted on site.

Eight primary system types were identified from the search:

- Track-mounted/crane/post fall arrest lanyard systems (site based)
- Deck-mounted fall arrest lanyard systems (vehicle based)
- Gantries, fixed or movable (site based)
- Fold-down walkways on the vehicle (vehicle based)
- Sheeting using external gantry (site based)
- Sheeting using suspended system (vehicle based)
- Side rails or sides on load bed (netting, cable, mesh, or strap) to provide edge protection
- Airbags/landing mats (site based)

Over a quarter (27%) of the systems identified were site-based work platforms, either fixed or mobile, that allowed safe access to the load bed and an area for the driver/loader to work away from the load bed.

21% of the systems identified were some form of vehicle-based edge guarding to prevent the driver/loader falling from the vehicle while working on the load bed.

Work platforms attached to the vehicle accounted for 15% of the systems identified. Similar to site-based platforms, these allowed safe access to the load and a safe area for the driver/loader to work around the load without accessing the load bed.

Site-based lanyard systems accounted for a further 15% of the systems identified. These comprised a harness to be worn by the driver/loader, and a fall arrest lanyard connected to an attachment point such as an overhead crane or track, or free-standing post.

The remainder comprised vehicle-based lanyard systems (12%), vehicle-based suspended sheeting systems (5%), and site-based airbags (5%).

A comparison of the systems to assess their characteristics and flexibility of use was carried out and the results are shown in Tables 4 and 5.

Table 4 Comparison of fall prevention systems

	Travels with the vehicle		Protects more than one person		Removes need to work on load bed	
	Yes	No	Yes	No	Yes	No
Track-mounted/crane/post fall arrest lanyard		X		X		X
Deck-mounted fall arrest lanyard	X			X		X
Gantries (fixed or movable)		X	X		X	
Fold-down walkways on the vehicle	X		X		X	
Sheeting using external gantry		X	n/a		X	
Sheeting using suspended system	X		n/a		X	
Side rails on load bed (netting, cable, or strap)	X		X			X
Airbags		X	X			X

Table 5 Use and flexibility of fall prevention systems

	Requires special equipment on the vehicle		Can be retrofitted	
	Yes	No	Yes	No
Track-mounted/crane/post fall arrest lanyard		X	n/a	
Deck-mounted fall arrest lanyard	X		X	
Gantries (fixed or movable)		X	n/a	
Fold-down walkways on the vehicle	X		X	
Sheeting using external gantry		X	n/a	
Sheeting using suspended system	X		X	
Side rails on load bed (netting, cable, or strap)	X		X	
Airbags		X	X	

4.2.2 Site-based lanyard system

A site-based fall arrest system, consisting of a harness worn by the driver connected to the lanyard of a fall arrest block mounted on an overhead structure, allows the driver to work on the load bed without the risk of falling from the vehicle.

Advantages: Lanyard systems can be used with vehicles of different sizes carrying a variety of load configurations. Can be retrofitted and requires no special equipment on the vehicle.

Disadvantages: Requires significant financial and yard space investment to install suitable structures and only provides protection at the site at which it is installed. Does not protect the driver against tripping or slipping on the load bed. Drivers will require training on the use of the system and equipment must be regularly inspected and tested. Drivers may be reluctant to wear harness to access the load bed. A rescue plan should be in place in case a driver falls, as prolonged suspension in a fall arrest harness may result in serious harm.

4.2.3 Vehicle-based lanyard system

A vehicle-based fall arrest system, consisting of a harness worn by the driver connected to the lanyard of a fall arrest block mounted on a rail in the load bed of the vehicle or on an overhead track fitted to the vehicle, allows the driver to work on the load bed without the risk of falling from the vehicle.

Advantages: Reduces the distance a driver can fall. Can be retrofitted and, since it travels with the vehicle, can be used on any site. Less expensive than site-based systems.

Disadvantages: May restrict loading/unloading access by fork lift truck. Does not protect against the driver tripping or slipping on the load bed and drivers may be reluctant to wear harness to access the load bed. Drivers will require training on the use of the system and equipment must be regularly inspected and tested. Lone working may be problematic due to the need for a rescue plan in the event of a fall.

4.2.4 Site-based gantries

Fixed or mobile gantries can be used to provide a safe working platform for drivers to work around the load without accessing the load bed itself, or to provide a safe means of access.

Advantages: Reduces the distance a driver can fall. Allows drivers to work at the same height as the load, giving a good view of any potential issues and reducing the risk of MSDs due to throwing webbing straps/other securing measures up and over the load. Mobile gantries can be moved around the site to where loading takes place. Anyone working on the load bed is protected.

Disadvantages: Requires significant financial and yard space investment and only provides protection at the base site. Does not protect against falls from the rear of the vehicle. Gantries may be damaged by HGV and fork lift truck movements. Does not prevent or mitigate falls on the load bed itself.

4.2.5 Sheeting using automated/suspended systems

Automated or suspended systems allow drivers to secure their loads with nets or tarpaulins from ground level. The systems may be manually or hydraulically operated.

Advantages: Eliminates the need to work at height. Can be retrofitted and can accommodate different vehicle sizes and load types. Travels with the vehicle and can be used at any site.

Disadvantages: Training may be required to operate hydraulic systems, and periodic maintenance will be required. Additional load restraint may be required for some load types.

4.2.6 Sides/side rails

Aluminium drop sides, curtain or net sides, and side rails provide edge protection for work on the load bed and may, in some cases, also provide load containment.

Advantages: Curtain or net sides are relatively inexpensive, lightweight, and can be easily retrofitted. Aluminium drop sides can provide load containment. Specialised training is not required. Travels with the vehicle and can be used at any site. Anyone working on the load bed is protected.

Disadvantages: Curtain or net sides do not provide any load securing and may, depending on design, impede the easy application of load securing equipment. Aluminium drop sides may present manual handling issues due to weight. Sides may be damaged by fork lift trucks during loading/unloading. Does not prevent or mitigate falls on the load bed itself.

4.2.7 Airbags/landing mats

Airbags and landing/crash mats are placed alongside the vehicle to provide a soft landing if a driver falls from the load bed.

Advantages: Relatively inexpensive, light weight, and can be easily moved around a site. Can be used with any vehicle and requires minimal maintenance. Training not required.

Disadvantages: Unsuitable for use when loading/unloading by fork lift truck. Setup is time-consuming and unlikely to be practical for multiple delivery stops at small sites/residential addresses. Has the potential to restrict safe access to the vehicle. Does not prevent or mitigate falls on the load bed itself.

5. DRIVER CONSULTATIONS AND COMPANY VISITS

5.1 DRIVER CONSULTATIONS

Drivers of ten flatbed vehicles were consulted during three roadside enforcement checks carried out by the Metropolitan Police Service, Warwickshire Police, and Humberside Police. Drivers were asked:

- How the vehicle had been loaded
- Who had secured the load
- Whether the load had been secured from ground level or had involved working on the load bed
- What access equipment and fall prevention equipment was available to them
- Whether they had experience of slips and trips on the load bed, or a fall from the vehicle
- Whether they had experience of a load shift or packaging failure

All of the drivers consulted secured their own loads and appeared to have a good understanding of muscular-skeletal disorders (MSDs) caused by bending, twisting, and manual handling and how to reduce the risk of injury.

All of the drivers consulted commented that many sites they delivered goods to had policies in place to prevent drivers accessing the load bed during unloading. They had all received training and/or instructions regarding the risk of working at height, either from their employer or from the site/s they delivered to/collected from.

Seven of the drivers stated that their employer prohibited them from accessing the load bed during loading and unloading. Two of the drivers stated that, while load bed access was not explicitly forbidden, they had no reason to access the load bed and did not routinely do so. One driver stated that he occasionally had reason to access the load bed, and the vehicle had been fitted with collapsible side rails that could be erected to provide fall protection when required.

One driver stated that, working for a previous employer, he had suffered a fall on the load bed attributed to loose product banding, resulting in a minor injury.

Four drivers stated that they had previously experienced packaging failures that had resulted in product damage and/or delays during unloading. They attributed these failures to:

- Pallet collapse (use of unsuitable/damaged pallets and overloading)
- Damage to packaging by the forks of a fork lift truck during loading or unloading
- Insufficient banding/shrink-wrapping of palletised loads
- Unsuitable load securing (e.g. webbing straps securing FIBC[1]s, resulting in damage to the bag and load spillage)

[1] *Flexible intermediate bulk container, or bulk bag – a flexible bag designed to hold loads such as sand, aggregate, and fertiliser*

Loading was carried out by fork lift truck (seven instances), site crane (two instances), or the on-board HIAB crane (one instance). Unloading was carried out by fork lift truck or HIAB crane.

Load securing for transport on the road had been achieved through the use of webbing ratchet straps in nine instances. In eight of those instances, strapping had been carried out from ground level; in one instance fixed gantries had been used. The remaining load had been secured by containment. There was little awareness of alternative securing systems, although one driver commented that he had seen another driver using a suspended strapping system.

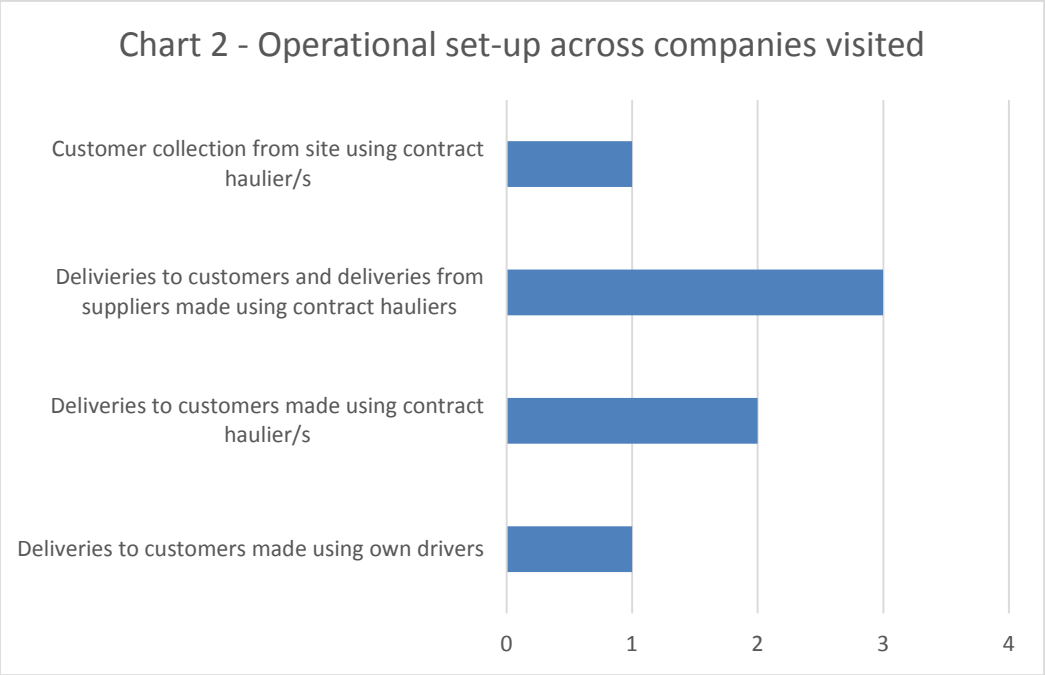
Despite the reliance on webbing straps as the primary means of load securing, there was little awareness of the effects of wear and tear on the strength of webbing straps, nor how the number of straps required to secure a load should be calculated. Four drivers stated that the 'LC' referred to on the label of a webbing strap indicated the weight of load it could safely secure, which is incorrect: 'LC', measured in decaNewtons (daN), refers to the maximum allowable force in a straight pull.

5.2 COMPANY VISITS

Seven companies were visited in order to assess working practices and establish factors that companies felt contributed to incidents. Four of the companies visited were also manufacturing sites, despatching products produced on site. Three companies visited received goods in from manufacturers and sorted and repacked them for onward transit.

At each company visit, the systems of work in use at the site were reviewed with a manager and the operation of the site discussed. Between one and three drivers at each site were then asked to outline their duties in relation to loading and securing, and if they had encountered any problems in preparing loads for transport.

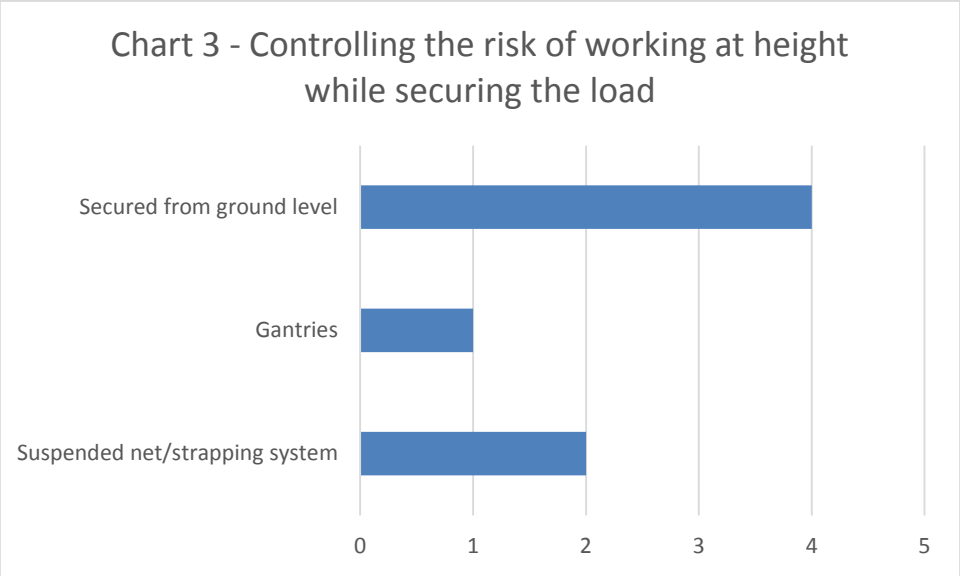
Operational set-up for the transport of goods varied between companies, as shown below in Chart 2. Only one company directly employed their own drivers. Five companies delivered to their customers, or delivered to customers and received goods in, via contract hauliers. One company visited did not arrange transport of their goods at all: customers were responsible for contracting with a haulage operator to collect goods from the site.



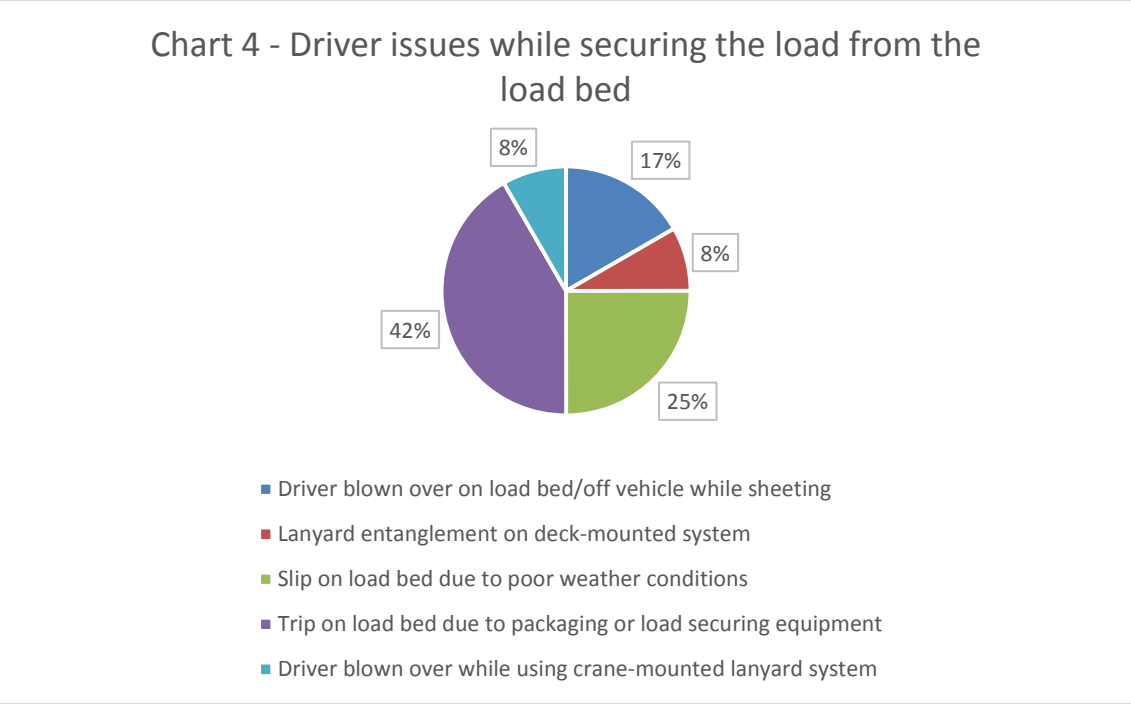
At all the sites visited, loading of vehicles was carried out by fork lift truck in a segregated area of the site with limited pedestrian access. In three instances, drivers were expected to direct the fork lift truck driver as to the placement of the load on the vehicle. In four instances, drivers were expected to remain in their cab while the vehicle was loaded. All sites had policies in place to restrict drivers from accessing the load bed during loading and unloading.

The distribution of securing methods is shown in Chart 3. In one instance, securing was carried out by site personnel. Once the vehicle was loaded, it was reversed between fixed gantries to provide a platform from which the site personnel could secure the load with webbing straps. This was considered to be a good way of reducing the risk of working at height. However, site personnel noted that the gantries had suffered damage due to vehicles being reversed into the supporting columns.

In six instances, the driver was expected to secure the load once it had been loaded onto the vehicle. In two of those instances, the load was secured using nets or webbing systems on a suspended system that could be operated from ground level. In the other instances, the load was secured by webbing straps from ground level. The driver had been provided with specialised equipment to help him place edge protectors on the load from ground level.



Eleven drivers were asked if they had experience of systems other than gantries or suspended nets or straps to avoid working on the load bed while securing loads, and what problems – if any – they had experienced previously while securing loads. These are shown in Chart 4:



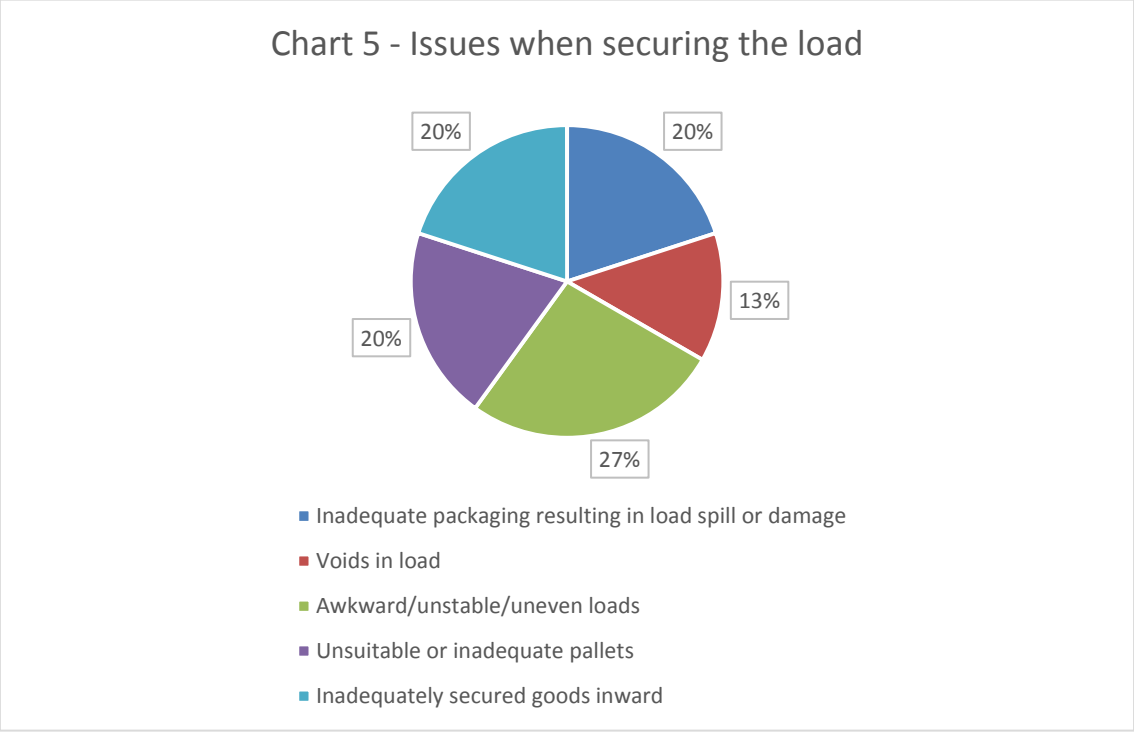
Two drivers had used fall arrest harnesses attached to a rail in the load bed (deck-mounted) and one had used a fall arrest harness attached to a crane. All three drivers reported issues with the systems used: the deck-mounted system had resulted in the lanyards becoming entangled with the load during loading, and the driver who had previously used a harness attached to a crane, reported he had been blown over in poor weather conditions which resulted in an injury when the lanyard became entangled with part of the load..

Without full details of these incidents, and with such a small sample size, it is impossible to draw conclusions from these reports, as the problems mentioned may well be a function of how the equipment was being used at the time rather than any inherent failing.

Adverse weather conditions were felt to be a contributory factor not only to injury incidents but also to a driver's sense of wellbeing when working on the load bed. Low light and low visibility conditions were felt to contribute to the likelihood of tripping over loose packaging or pallet edges, or for the driver to misjudge the edge of the load bed and fall. Drivers believe that inclement weather, particularly rain and snow increase the risk of the driver slipping on the load bed due to both the reduction in friction of the working surface and drivers working at a faster rate to minimise their exposure to the poor weather.

Managers and drivers were generally positive about load securing from ground level, however some drivers expressed concerns regarding the health effects of throwing webbing straps over loads from ground level, specifically muscular-skeletal injuries to the arm/shoulder. These drivers mentioned automated sheeting and suspended securing systems that they were aware of through discussions with other drivers, although they had not used them personally.

Drivers and managers on each site were asked what issues they encountered when securing loads on vehicles, or on vehicles arriving on site, and their responses collated by site. The distribution of the issues stated across all seven sites is shown in Chart 5 below.



Almost a third of the sites visited reported issues regarding the securing of 'awkward' loads. These were typically pallets loaded with unusually-shaped items or mixed loads of different goods both of which made securing with webbing straps difficult. An issue specific to inward goods delivery was inadequate securing: it was noted that vehicles would regularly arrive on site with pallets that had moved or collapsed in transit, resulting in product damage and subsequent delays while the vehicle was unloaded.

Poor packaging and the use of unsuitable or damaged pallets were felt to be significant contributors to load movement and collapse. 'Poor packaging' covered a range issues such as:

- Packaging too fragile to withstand the downward force exerted by webbing straps
- Wrapping the load with one layer of shrink wrap and then using wrapping tape around the load, which was not strong enough to prevent items moving relative to each other
- Not shrink-wrapping the load to the pallet, resulting in the load sliding relative to the pallet

Voids or gaps in the load were also felt to be an issue by a small number of respondents. These voids typically resulted from loading the vehicle so that there was a gap between the front of the load and the headboard of the vehicle (to prevent overloading), or to facilitate equal load distribution across and along the load bed.

The division of responsibility for loading and unloading a vehicle was not always clear on the sites visited, particularly where a number of companies and individuals were involved in the day-to-day operations.

6. COMMON ISSUES

Issues raised by drivers at the enforcement checks, and drivers and managers on sites, were collated and reviewed to identify common areas of concern. These concerns were divided into four topics.. It should be noted that some of the issues raised were either historical or issues they felt affected other drivers; they did not necessarily relate to their current employment.

6.1 VEHICLE ACCESS

- Safe means of access to the load bed at primary site but not at delivery sites
- Poor condition of access equipment provided
- Use of access equipment in wet/icy/windy conditions

6.2 WORKING ON THE LOAD BED

- Limited space to work safely
- Wet/icy conditions result in load bed becoming slippery
- Low light conditions can result in driver inadvertently stepping off load bed
- Working in high winds can result in driver being blown off the vehicle, especially when sheeting
- Load collapse/shift resulting in driver falling off the load bed
- Trips and slips on loose shrink-wrapping, webbing straps, banding, and pallet edges
- Being struck by FLTs/overhead crane
- High MSD risk when moving/lifting heavy items in awkward postures
- MSD risk when sheeting due to weight of sheet

6.3 LOADING, LOAD PACKAGING, AND LOAD SECURING

- Poor quality pallets
- Poor packaging material, shrink-wrapped stacks not wrapped to pallets
- Unstable pallet stacks
- Substantial voids left in load during loading
- Unsuitable load securing equipment used
- Insufficient and defective load securing equipment used
- Load settlement and movement during transit

6.4 HUMAN FACTORS

- Time pressure on drivers making multiple drops
- Sheeting, in particular, is heavy manual labour and fatigue can be an issue when drivers are securing and sheeting repeatedly in a working day
- Some sites considered to be reluctant to allow drivers space and/or equipment to safely secure their loads

7. CONTROLS

Control measures used by drivers at the enforcement checks, and drivers and managers on sites, were collated and reviewed. A clear trend of removing the need to work on the load bed wherever possible was identified. This could be broken down into three approaches:

- No work at height (load mechanically loaded, sheeted/secured from ground level)
- Guarded work at height (load mechanically loaded, secured from gantries/platforms with guard rails)
- Protected work at height (load mechanically loaded, side rails attached to vehicle for edge protection)

Controls that removed the need to work on the load bed itself appeared to be viewed positively by the drivers interviewed, with the caveat that equipment provided to them was not always suitable or adequately maintained. Drivers had good awareness of the risks of falls and MSDs and were very vocal in their endorsement of equipment that was particularly effective in mitigating those risks.

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Access to and work on flatbed vehicles

Flatbed vehicles are widely used to transport many types of goods on the road. They offer advantages over closed vehicles in terms of easy access to the load bed for loading and unloading and versatility of use.

A number of fatal or major incidents are reported to HSE and local authorities where drivers, members of the public, or site personnel have been injured during the loading and unloading of these vehicles.

This report describes a multi-disciplinary, mixed-method approach to research on this topic, comprising both quantitative and qualitative analysis, undertaken to establish contributory factors to incidents and areas of concern when accessing or working on flatbed vehicles.

It is intended that this work will help to inform industry stakeholders in developing updated guidance on safe delivery using flatbed vehicles.

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