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Safety of Industrial Lift Trucks

A Survey of Investigated Accidents and Incidents [April 1997 to March 2001]

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Summary

This Specialist Inspector Report describes accidents and incidents associated with industrial lift trucks that were investigated by HSE inspectors over the period April 1997 to March 2001. It identifies a number of common reasons for accidents and incidents and the causal factors associated with them. It is intended to provide information to assist in the development of safety requirements for the design and use of these machines and to assist in the training of drivers and others affected by industrial truck use.

The Health and Safety Executive employs a wide range of qualified and experienced Specialist Inspectors who, in the course of their work, acquire a substantial amount of information and expertise about workplace hazards. Much of this is used in the preparation of official HSE Guidance Notes and formal advice. However, other material that might be less developed could contain useful ideas and be helpful to people involved in health and safety. Such material could also stimulate discussions about problems and their solutions and encourage others to come forward with ideas and practical improvements. Specialist Inspector Reports are designed to publish this material. Any opinions and/or conclusions expressed in this report are those of the author(s) alone and do not necessarily reflect HSE policy.

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ANNEXES

INTRODUCTION

1. HSE inspectors investigated 1204 accidents on industrial lift trucks over the 4 year period from 1 April 1997 to 31 March 2001. On average, this equates to approximately 1 investigated accident every working day in the UK over this period.

2. This report provides data on accident causation obtained from accident/incident investigation reports made by HSE inspectors. The data is of value to safety authorities and truck manufacturers, suppliers, trainers and users to address safety shortcomings through design and safe working methods. It provides data for the prioritisation of safety interventions and information that can help to identify appropriate safety measures to address particular areas of concern.

SURVEY SCOPE AND NATURE

3. The survey was carried out using data taken from HSE's FOCUS database over the period 1 April 1997 to 31 March 2001. It included investigated accidents/incidents involving all types of powered and pedestrian propelled lift trucks in all industrial sectors covered by HSE. It did not include reported accidents or dangerous occurrences that were not investigated by HSE or accidents /incidents reported to or investigated by local authorities.

4. This report covers investigated accident/incidents so it does not identify all reported accidents/incidents on industrial lift trucks. However, it does provide data on the most common reasons for accident/incidents and the trucks involved. It also gives information on the relative numbers of accidents/incidents and the causal factors behind them

DETAILS OF SURVEY

5. Text searches, using the criteria given in Annex 1, were conducted using HSE's FOCUS database. The searches identified 4,200 accidents and dangerous occurrences in which industrial lift trucks were mentioned in the investigation summaries.

6. The text searches were analysed and a total of 1204 accidents and dangerous occurrences were identified in which industrial lift trucks contributed to the outcome. The data in this report was obtained from these reports.

NUMBERS OF ACCIDENTS/INCIDENTS RELATED TO THE NUMBERS OF TRUCKS IN USE

7. The numbers of trucks and where they are used influence the number of accidents in different industrial sectors. It is not possible to identify the number of trucks in each sector. Nevertheless, it was possible to estimate the overall relative numbers of powered trucks in use from sales and expected truck life data provided by industry sources (Annex 2). The data does not include figures for articulated steer (masted) trucks or container handlers. It is worth noting, however, that these types of truck represent a small proportion of the overall number of trucks in use so the numbers involved are not likely to alter the figures to a significant degree.

8. Included in Annex 2 is a 'Risk index' figure that was calculated using truck population and investigated accident/incident data for powered trucks. Equivalent risk indices were not calculated for pedestrian propelled (i.e. non-powered trucks) because no population data was available.

9. Annex 2 shows that, in proportion to the overall numbers of trucks in use, accident/incidents on side loaders were more than 2.5 times more likely to be investigated than accident/incidents on counterbalance trucks. Similarly, counterbalance truck accidents were nominally 3 times more likely to be investigated than all-terrain and reach trucks and 4 times more likely than variable reach and pedestrian controlled trucks.

GENERAL ANALYSIS

Comparison with workplace transport

10. The estimated numbers of accident/incidents involving industrial lift trucks as a proportion of the total number of transport accident/incidents reported to HSE are given below:-

Severity of accidents	Proportion of all transport accidents (%)
1997/98	15
1998/99	14
1999/00	14
2000/01	14

11. The distribution of accidents reported to HSE, excluding dangerous occurrences, by severity for industrial lift trucks compared with all transport accidents investigated is:-

Severity of Accidents	Industrial lift trucks (%)	Transport (%)
Fatal	0.6	0.7
Major	28.8	27.8
Over 3 day	70.6	71.5

12. The above 2 tables indicate that industrial truck accident/incidents represent a significant proportion (nominally 14.5%) of all transport re-

lated accidents.

13. Detailed data on the nature and number of accident/incidents investigated and the severity of injuries sustained are given in Annexes 3 and 4. It can be seen that the highest number (524) and proportion (44%) of accident/incidents involved people being struck by a moving truck.

Breakdown by truck type

14. The overall numbers of accident/incidents investigated and the terminology used to describe the different types of truck covered by the survey are given in Annex 5.

15. Inspectors generally refer to counterbalance trucks as fork lift trucks (FLTs) and rough terrain versions as “All-terrain” or ”Rough terrain” trucks. Also, the term counterbalance truck is widely used by inspectors to describe masted, centre-seated counterbalance trucks. For this reason the data for “FLT (not specified)” has been combined with the data obtained for “Counterbalance” trucks and used to represent accident/incidents involving masted, centre seated, counterbalance trucks that are not of an all-terrain type. Wherever trucks are identified as “Counterbalance” in this report this is the type of truck being referred to.

16. Annex 5 gives the number of accident/incidents investigated on each truck type. The percentages by severity of injury are given in Annex 6. It can be seen that counterbalance trucks are involved in the majority (906), i.e. 75% of all accident/incidents investigated. The breakdown of accident/incidents and dangerous occurrences for this type of truck in relation to severity is 4% fatal, 45% major, 41% over 3 day and 10% dangerous occurrence. This presents a similar pattern to the overall picture for all trucks (see paragraph 11).

17. The overall number of accidents involving variable reach trucks was nominally 13 times lower than counterbalance. Nevertheless, 21% of the total number of fatal accidents investigated involved this type of truck. Also, 15% of accidents/incidents associated with variable reach trucks involved fatal injuries (significantly higher than any other truck type). This indicates that when accidents occur on variable reach trucks they are more likely to involve fatal injuries than on any other type of truck.

18. Nominally, 53% of accidents/incidents investigated on all-terrain, reach and side-loader trucks involved fatal or major injuries, which is higher than the 44% average for all trucks.

19. With the exception of reach trucks, ride-on (seated) warehouse trucks, i.e. order pickers, side reach and articulated steer trucks, were involved in only 1% of investigated accidents/incidents although they represent nominally 8% of all powered trucks in use. This would indicate that, in general, accidents on these types of truck are of a lesser severity than on other powered types.

20. A significant percentage of the overall number of accidents/incidents investigated involved pedestrian controlled trucks (6%), i.e. pallet and stacker trucks, and reach trucks (4%). It is significant, however, that no fatal injuries were investigated on pedestrian controlled trucks and the 1 fatal accident that occurred on a reach truck involved a falling load.

PERSON INJURED

Distribution by person injured

21. Annex 7 shows the different people injured in the accidents investigated and the numbers of accidents (excluding dangerous occurrences) associated with different truck operations. The relative numbers of people injured are pedestrians (58%), drivers/operators (32%), lorry/visiting drivers (5%), passengers (2%) and maintenance personnel (1%).

Pedestrian/operatives

22. The majority of accidents to pedestrian/operatives (65%) occurred when they were struck by moving trucks. Pedestrians/operatives were also injured when they were struck by falling loads (10%), involved in falls from a height exceeding 2m (8%), struck by objects after trucks collided with or contacted them (7%), were trapped by a moving part of a truck or between a truck and another object (4%) or were involved in slips, trips or falls of less than 2m height (2%). Together these types of accident accounted for 96% of the investigated accidents involving pedestrian/operatives.

23. The proportion by severity of injuries for the above accident/incidents are given below:-

Nature of accident/ incident	% by nature of accident		
	Fatal	Major	Over 3 day
Struck by moving truck	2	50	48
Struck by falling load	10	49	41
Fall from height	6	82	12
Struck by object that truck contacted	2	24	73
Trapped by a moving part of the truck or between the truck and an object	8	72	20
Slip, trip or fall from height less than 2m	10	80	10

Drivers

24. Overturning of trucks accounted for 24% of accidents involving drivers. Collisions with fixed objects or other vehicles accounted for a further 25% of accidents and being struck by a moving truck a further 18%. These were the most common reasons for injuries to drivers and accounted for 67% of investigated accidents in which the driver was injured.

25. Drivers also suffered injuries after falling from a height of less than 2m (7% of accidents involving drivers), being trapped by a moving part of the truck or between the truck and another object (6%) and being struck by a falling load (4%). The remaining 16% of accidents that involved injuries to drivers occurred for a wide variety of reasons.

26. The proportion of accidents by severity for the above natures of accident are:-

Nature of accident/ incident	**% for each nature of accident**		
	Fatal	**Major**	**Over 3 day**
Overturn	16	51	33
Collision with fixed object or another vehicle		50	50
Struck by moving truck	8	38	54
Slip, trip or fall from height less than 2m	4	38	58
Being trapped by a moving part of a truck or between a truck and another object	15	50	35
Struck by falling load	15	54	31

Lorry/visiting drivers

27. A significant number of accidents (49) involved lorry/visiting drivers. The majority of these accidents (78%) occurred when lorry/visiting drivers were struck by moving trucks, often during loading/unloading operations. Lorry/visiting drivers were also injured when they were struck by falling loads (16%) during loading/unloading operations. Together these 2 types of accident accounted for 94% of accidents investigated in which lorry/visiting drivers were injured.

28. The severity of accidents as a proportion of the total number of accidents sustained are:-

Nature of accident	**Proportion of accidents by severity (%)**		
	Fatal	**Major**	**Over 3 day**
Struck by moving vehicle	5	53	42
Struck by falling load	13	74	13

Passengers

29. Being struck by moving trucks accounted for 67% of investigated accidents involving passengers. These accidents generally occurred when the passengers were attempting to alight or dismount from a truck.

30. Being trapped by a moving part of a truck or between a truck and another object accounted for 14% of accidents incidents to passengers. In addition, 14% of injuries to passengers occurred in slip/trip/fall accidents.

31. The severity of injuries as a proportion of the overall number of accidents investigated are:-

Nature of accident	Proportion of accidents by severity (%)	
	Major	Over 3 day
Struck by moving vehicle	71	29
Slip/trip/fall	67	33
Trapping/shearing/ crushing		100

32. There were no fatal accidents to passengers.

Maintenance personnel

33. A total of 14 accidents involved maintenance personnel. None involved fatal injuries.

34. Maintenance personnel suffered major and over 3 day injuries when they were struck by moving trucks (36% of accidents investigated), when they suffered trapping/shearing/crushing accidents (29%) and when they were struck by falling loads (14%). They also suffered major injuries when batteries/fumes exploded or tyre or wheel failures occurred during maintenance operations (21% of accidents investigated).

35. The severity of injuries as a proportion of the overall accident/incidents investigated under each nature of accident are:-

Nature of accident	**Proportion of accidents by severity (%)**	
	Major	**Over 3 day**
Struck by moving truck	60	40
Trapping/shearing/ crushing	50	50
Explosion	100*	
Struck by falling load	100+	

* denotes 3 accidents in this category
\+ denotes 2 accidents in this category

DRIVER TRAINING

36. In 125 (10%) accident/incidents investigated inspectors identified that the truck driver was untrained or inadequately trained.

37. In overturning accidents/incidents a higher then average percentage (35%) involved drivers who were identified as being untrained or inadequately trained.

NATURE OF ACCIDENTS

Fatal accidents

General

38. A total of 53 fatal accidents were investigated between April 1997 and March 2001 (Annex 8).

39. Counterbalance trucks accounted for 38 (72%) fatal accidents and variable reach 11 (21%). Taking into account the relative numbers of trucks in use; i.e. 49% counterbalance and 16% variable reach; it is apparent that there is a substantially higher likelihood of fatal accidents on these trucks than on the other types.

40. All-terrain, order picker, reach and side loader trucks were each involved in 1 fatal accident.

41. The most common types of fatal accident are:-

Type of accident	Proportion of accidents (%)
Overturn	30
Struck-by moving truck	28
Struck by falling load	17
Trapped by mast/overhead guard	9
Fall from height	6
Low fall (waste disposal)	4
Total	94

Overturn

42. Of the 16 fatal overturning accidents investigated 11 (69%) occurred when trucks were travelling or turning while moving between locations in forward or reverse directions. Counterbalance trucks were involved in 10 (91%) of these travelling/turning accidents. This is a highly significant percentage compared with the number of counterbalance trucks in use, i.e. nominally 49% of the overall truck population. It shows a high risk of overturn when trucks are travelling or turning while moving between locations compared with the other truck types.

43. Common causal factors identified for the above accidents were trucks travelling and turning with their masts and/or attachments raised (both loaded and unloaded), trucks turning suddenly when travelling on level and/or uneven ground and turning at speed on slopes. Other causal factors were driving into potholes, objects or kerbs while turning, driving over edges and contacting overhead objects with an extended mast. It is important to note that accidents occurred when trucks were being operated unloaded on level ground with the forks in the proper travel position, i.e. close to the ground.

44. Two fatal accidents occurred when trucks were lifting long and dynamic or offset loads:-

- 1 counterbalanced truck overturned while attempting to lift an offset long load (vehicle chassis) on a cross gradient
- 1 variable reach truck overturned because the truck suffered lateral overload while being driven on uneven ground with a wide, dynamic load (roof trusses) suspended from its fully extended boom.

45. A variable reach truck was involved in a fatal accident to the driver when it was parked with its bucket protruded into a roadway. The bucket was struck by a passing HGV causing the truck to overturn.

46. A counterbalance truck driver suffered fatal injuries when the vehicle he was loading drove away contacting the raised truck forks causing it to overturn.

47. Rearward overturns are rare. However, one counterbalance truck suffered rearward overturn when it was reversed into a vehicle pit.

Struck by moving truck

48. Of the 15 fatal struck by moving truck accidents 8 (53%) involved counterbalance trucks, 6 (40%) variable reach trucks and 1 (7%) side loader. This shows a high proportion of fatal struck by moving truck accidents associated with variable reach trucks compared with the proportion in use (i.e. 16%). By comparison, the proportion of fatal struck by moving counterbalance truck accidents was nominally equivalent to the proportion of powered trucks in use (i.e. 49%)

49. Trucks moving from stationary positions accounted for 8 (53%) of the above accidents:-

- 4 (50%) accidents involved trucks being driven away from stationary when people were standing close by. Turning while driving away was identified as a contributory factor in 2 of these accidents. In both accidents involving variable reach trucks the trucks were driven away in reverse.
- 4 (50%) accidents occurred when counterbalance and variable reach trucks rolled away non-powered from stationary positions. The accidents occurred because trucks were parked on gradients or level ground without the parking brake being applied or adequately applied often with the engine running. Lack of or ineffective maintenance of the parking brake was given as a contributory factor in 2 accidents.

50. Counterbalance trucks were involved in 3 fatal accidents when trucks were manoeuvring during loading/unloading operations. In 2 of these

accidents pedestrian/operatives were injured when trucks were reversing. In the third a lorry driver was approaching the truck when he was struck by it.

51. One fatal accident involved a counterbalance truck and another a variable reach truck that were travelling in a forward direction. In both accidents the load carried obscured the driver's visibility.

52. A side loader was involved in 1 fatal accident when it reversed into a pedestrian/operative in a wood yard. The truck was only lightly loaded but vehicle visibility and workplace layout were given as contributory factors.

Struck by falling load

53. Seven fatal accidents involved counterbalance trucks. Six (86% of fatal struck by falling load accidents) involved loading/unloading or stacking operations or trucks travelling with loads. Five (71%) involved long loads such as angle iron, pipes and a truck mast. One accident involved overload that occurred due to a heavy load being raised to too great a height during stacking operations.

54. One accident involved a round bale falling from a grab attachment when the truck was stationary. Inappropriate handling techniques were being used because the grab was not designed for handling round bales and 2 bales were being carried at the same time.

55. A reach truck struck an overhead door lintel and the falling load struck the driver.

Trapped by mast/overhead guard

56. Five people suffered fatal injuries when they were trapped after climbing up between the mast and overhead guard on counterbalance trucks. These accidents occurred when the injured persons contacted the mast tilt control with their feet while standing on the truck dash. A common factor that led to these accidents was the desire of the driver to place material over the overhead guard to protect against the weather when working outside and the driver leaving the truck running while standing on the dash.

Fall from height

57. Three accidents occurred when people fell after being raised on stationary trucks to carry out work at height. All three accidents occurred because temporary access to height was being attained using unsafe methods. Causal factors were operatives being raised on the forks of trucks and pallets or other objects, such as stillages, on the forks that do not adequately protect against falls from height and that are not adequately restrained from movement while on the forks.

Low fall (waste disposal)

58. Two fatal accidents occurred during waste disposal operations. One involved a counterbalance truck and the other a masted all-terrain truck. In both accidents the deceased was standing on an object on the truck forks emptying waste into a skip when they fell from a height of less than 2m.

Fatal, major and over 3 day accidents

General

59. A total of 1069 fatal, major and over 3 day accidents were investigated (Annex 9). This included 585 fatal and major accidents (Annex10).

60. Counterbalance trucks accounted for 76% of all fatal, major and over 3 day accidents investigated and, similarly, 76% of fatal and major accidents. Even discounting for the relative number of trucks in use it is clear that counterbalance trucks are involved in a disproportionately high number of fatal, major and over 3 day accidents.

61. The numbers of accidents that occurred for different reasons are shown below against the percentage of the overall numbers of fatal, major and over 3 day accidents investigated.

Nature of accident	Proportion of accidents (%)		
	Fatal	Fatal & major	Fatal, major & over 3 day
Overturn	30	11	9
Struck-by moving truck	28	46	49
Struck by falling load	17	10	8
Trapping/shearing/ Crushing	9	6	5
Fall from height	6	8	5
Slip/trip/fall	4	4	4
Collision/contact with object that struck person	2	2	4
Mechanical failure/fault	2	1	2
Loss of control	2	1	1
Collision (fixed object)		5	5
Collision (overhead object/door lintel)		1	<1
Collision (moving truck)		2	3
Collision (stationary vehicle)		1	1
Explosion		1	1
Harmful release		1	1
Ergonomic			1
Steering wheel kick-back		<1	<1
Total	100	100	100

62. The above table shows that when overturning accidents occur they are more likely to involve fatal injuries than any other type of accident. It also shows that struck by moving truck accidents are the most likely accident to occur and 49% of all accidents are for this reason

63. The following accounted for 93% of all accidents:
- overturn,
- struck by moving truck,
- struck by falling load,
- trapping/shearing/crushing,
- fall from a height greater than 2m,
- slip/trip/fall from height less than 2m, and
- collisions with moving and stationary trucks or objects

Dangerous occurrences

64. A significant proportion (45%) of overturns investigated involved dangerous occurrences. While this could indicate that the consequence of an overturning accident is comparably low it should be remembered that overturning was the type of accident in which fatal injuries were most likely to be sustained.

65. Mechanical failures and faults included a significant proportion (23%) of dangerous occurrences and only 2% of mechanical failure/fault accident/incidents investigated resulted in fatal or major injuries. This indicates a relatively low risk of injury in this type of accident.

TRUCK OPERATION

Accident/incidents

66. Annex 11 gives the number of accident/incidents investigated by the nature of operation of the truck at the time of the accident. Annex 12 shows the corresponding proportions of accident/incidents against nature of operation and severity.

67. The highest proportion (25%) of accidents/incidents investigated involved trucks travelling or reversing a significant distance that could not be classed as manoeuvring. Travelling or reversing usually indicated that the truck was moving between two locations inside or outside buildings rather than manoeuvring as part of a specific work activity or to change direction. In addition, trucks being turned when travelling forwards or reversing accounted for 12% of the total number of accidents/incidents investigated.

68. Other reasons for accidents/incidents were:
- trucks being driven away from a stationary position in forward or reverse directions under power (12%),
- carrying out operations while stationary, e.g. lifting people or loads (9%),
- manoeuvring to change position or direction (6%), and
- being involved in loading/unloading operations (4%).

69. Significantly, 4% of accidents/incidents occurred when trucks, moved away from a stationary position non-powered. Normally, the trucks were unmanned.

Fatal accidents

70. Annex 13 shows the number of fatal accidents investigated when trucks were being operated in different ways.

71. Fatal accidents occurred when trucks were moving, as they were moved from stationary under power or when they rolled away non-powered from a stationary position. They also occurred when trucks and were parked. The reasons for these accidents were different.

72. The majority (40%) of fatal accidents occurred when trucks were travelling, reversing or turning while travelling. Overturning accounted for 65% of these accidents. Being struck by a moving vehicle accounted for a further 20% of these travelling, turning and reversing accidents and being struck by a falling load 10%. Together this represents 95% of all fatal travelling, reversing or turning while travelling accidents investigated.

73. The most common reason for fatal accidents when trucks were parked was people being crushed between the mast and overhead guard. This type of accident accounted for 38% of these accidents. A further 31% of these accidents occurred when people fell from the forks or objects on the forks from heights of greater than and less than 2m. The remaining 31% of accidents occurred due to falling loads (2 accidents) and trucks overturning when they were struck by another vehicle (1 accident) or overbalanced by a large unstable load (1 accident).

Fatal, major and over 3 day accidents

74. Annex 14 gives the numbers of fatal, major and over 3 day accidents investigated when trucks were being operated in different ways. Annex 15 shows the same for fatal and major accidents alone.

75. The percentages of fatal, major and over 3 day accidents investigated against how the truck was being operated are shown below:-

Nature of operation	Proportion of accidents (%)		
	Fatal	Fatal & major	Fatal, major & over 3 day
Parked	25	12	9
Travelling	23	27	28
Stationary (non-powered movement)	8	4	4
Turning	15	11	12
Loading/unloading	11	9	9
Stationary (powered movement)	8	12	13
Lifting/lowering a load	8	6	5
Reversing	1	8	9
Stacking	1	2	1
Manoeuvring		8	7
Truck on lorry back/ramp		2	2
Refuelling/recharging		<1	1
Coasting to a halt		<1	<1
Total	100	100	100

76. The majority of accidents (49%) occurred when trucks were travelling or reversing for significant distances, including when they were turning while travelling in forward or reverse directions.

77. Significant numbers of accidents occurred when trucks were:

- moved under power from a stationary position (13%), often when reversing, and
- when they were stationary (9%).

[*NOTE: Falls from height and trapping/shearing/crushing were often associated with parked trucks*]

78. Trucks involved in loading/unloading operations or that were manoeuvring when carrying out operations or changing direction were involved in 16% of the accidents investigated.

79. Trucks that were reversing during loading/unloading operations or while manoeuvring or starting to move in forward or reverse directions were involved in 12% of accidents.

80. Trucks travelling in reverse, reversing and turning in reverse were involved in 15% of accidents. This compares with 13% of accidents investigated involving trucks that were travelling in a forward direction and a further 12% of accidents in which the direction of the truck was not specified. Additionally, trucks reversing while manoeuvring, being involved in loading/unloading and stacking operations and moving from stationary under power in a reverse direction accounted for 12% of accidents. Overall reversing trucks were identified as being involved in 27% of fatal, major and over 3 day accidents.

CAUSAL FACTORS

Collision

81. Of the 152 collisions that were investigated 87 (57%) occurred on counterbalance trucks and 34 (22%) on pedestrian controlled trucks. A further 13 (9%) occurred on reach trucks, 8 (5%) on side loaders and 7 (5%) on pedestrian propelled trucks. No collisions were investigated on variable reach trucks.

Counterbalance

Fixed objects

82. Drivers were injured in 24 accidents involving collisions with fixed objects. There was little consistency in the causal factors for these accidents. However, the majority (17) occurred when the trucks were travelling and turning while travelling. A smaller number (4) occurred when trucks were turning while reversing from a stationary position.

83. The presence of vertical uprights/columns in areas where trucks travelled, whiplash in the collision and drivers having their limbs outside the truck when the truck struck an upright or wall were causal factors in a significant number of accidents. Surprisingly, excess speed was mentioned as being a causal factor in only 3 accidents.

Moving trucks

84. Drivers were injured in 14 accidents involving collisions with other moving trucks. These accidents often occurred in loading bays, yards, warehouses and despatch/stock holding areas. They were caused in some cases when trucks emerged from aisles formed by racking or high stacks or where trucks were operating in congested thoroughfares where other vehicles, e.g. other trucks or road vehicles, were operating. Workplace layout and rules or lack of visibility caused by obstructions in the workplace and sometimes loads on the trucks were recorded as causal factors in approximately 65% of these accidents.

Object that moved and contacted a person

85. A total of 32 accidents occurred when counterbalance trucks hit or contacted objects that subsequently moved and contacted other pedestrians or operatives. A further 1 accident occurred for the same reason to a visiting driver and 3 drivers were injured when trucks collided with

racking or high stacks that collapsed on them.

86. Workplace layout and rules were given as a causal factor in 17 (53%) accidents involving pedestrian/operatives.

87. Collapse of the object struck was given as a causal factor in 28% of accidents involving pedestrians/operatives and in all 3 accidents involving drivers.

88. Contact often occurred when trucks were manoeuvring, while dropping off or picking up pallets or bins, or when objects were struck by passing trucks in production or storage areas. Nominally, 56% of accidents to pedestrians/operatives occurred when pallets, bins or stacks were contacted and moved.

89. Travelling trucks accounted for 58% of accidents, 17% occurred when trucks were manoeuvring or involved in stacking operations and 6% occurred when trucks collided with objects while reversing from a stationary position.

Stationary vehicles
90. Stationary vehicles were collided with in 6 accidents. There were no consistent reasons for these accidents although 2 accidents occurred when trucks were reversing, 2 when manoeuvring and 1 when carrying out loading/unloading operations. There is evidence to suggest that these accidents are likely to have occurred when trucks were manoeuvred in congested areas.

Overhead objects
91. A total of 4 accidents/incidents were investigated. In all accident/incidents the trucks were travelling. One accident resulted in major injuries to the truck driver when the truck mast struck a fully raised roller shutter door that was dislodged and fell onto the truck. Another accident involved over 3 day injuries to a pedestrian/operative when an overhead door lintel was dislodged by a truck mast followed by collapse of a wall.

92. Two dangerous occurrences occurred, one where a door lintel was dislodged causing wall collapse and the other where some bridge racking was struck and dislodged causing a partial racking collapse.

Pedestrian controlled
Fixed objects
93. Collision with fixed objects accounted for 58% of the 31 accidents/incidents on pedestrian controlled trucks. In all of these accidents/incidents the driver was the person injured, usually because they were trapped between the truck and the fixed object.

94. In 72% of the above accidents/incidents the truck was travelling or manoeuvring while being controlled by a ride-on driver. Injuries often occurred because the driver's limbs overhung the truck or ride on platform or the driver had dismounted as the truck was coming to a halt. The remaining 28% of accidents occurred when drivers were operating trucks in pedestrian mode and they were trapped against fixed objects as the truck was reversed, usually when turning, or manoeuvring.

95. A significant number of injuries in collisions with fixed objects occurred through trucks contacting raised objects such as barriers, racking, pallet stacks and high kerbs. In these accidents the ride-on drivers legs were often trapped between the truck and the raised barrier as the truck ride on platform went underneath the raised object.

Stationary vehicle
96. One accident/incident was investigated in which the driver was injured when he reversed the truck into a stationary truck. The driver was operating the truck as a ride-on truck when he contacted the raised forks of the stationary truck while manoeuvring. The causal factor of colliding with a raised, fixed object was consistent with accidents that occurred in collisions with fixed objects (paragraph 95).

Moving truck
97. Of the 7 accidents/incidents investigated 6 (86%) occurred when the pedestrian controlled truck was travelling forward or reversing between locations, either in ride-on or pedestrian mode.

98. Accidents commonly occurred in storage/warehouse environments when trucks were passing through doorways/plastic curtains or emerging from aisles formed by stored items or racking. Workplace layout/rules were given as causal factors in 57% of accidents/incidents.

Object that moved and contacted a person
99. All 4 accidents investigated involved injuries to pedestrian/operatives when trucks were being used in ride-on mode. The trucks were travelling, turning or being used in loading/unloading operations when the accident/incidents occurred. Injuries were sustained due to racking collapse, objects moving after being struck because they overhung vehicle routes and stored objects being contacted while loads were being picked up or deposited.

Reach
Fixed object
100. Of the 13 accident/incidents involving reach trucks, 69% involved collisions with fixed objects

and all resulted in injuries to drivers. Major injuries were sustained in all but 2 of these accidents. In 56% of these accidents the drivers claimed to be putting their legs outside the drivers cab in an attempt to stop the truck colliding with a wall or racking when trucks were reversing or turning.

Door lintel

101. Two accidents/incidents occurred when trucks were travelling, one forward and the other reverse, and both resulted in major injuries to the drivers when they fell from the cabs on impact with the door lintels.

Moving truck

102. Two accidents/incidents occurred when reach trucks were travelling forwards. In one, a large tool cabinet on the forks obscured the driver's vision. The reach truck collided with a ride-on, pedestrian controlled, pallet truck causing injury to the driver. In the other the reach truck was travelling through a plastic curtain strip doorway when it collided with a pedestrian/operative standing on the other side.

Side loader

Fixed object

103. Three accidents/incidents occurred in wood yards. One of these accident/incidents involved a dangerous occurrence when a parked side loader rolled away from a stationary position while parked on a slope. The parking brake had not been applied or the wheels chocked. The other 2 involved hand injuries to drivers when stacks of timber were collided with and the driver either had their hand or part of their hand outside the cab.

Moving truck

104. Two accident/incidents occurred when side loaders collided with other trucks in wood yards. The 3rd occurred when a side loader collided with another truck as it passed through a factory doorway. Inadequate driver visibility was not given as a causal factor in any of the accident/incidents although it seems that workplace layout/rules could have an influence.

Overhead object

105. A dangerous occurrence and an accident in which the driver suffered major injuries occurred when an overhead crane and an overhead beam were struck. In the accident involving the overhead beam the driver's injuries were sustained when they fell from the truck.

Pedestrian propelled

106. All 7 collisions investigated occurred when trucks were travelling and sometimes turning. Nominally 57% of accidents involved drivers and 43% pedestrian/operatives.

107. Commonly, loss of control was a reason for accidents. This often occurred when the persons pulling/pushing the trucks lost control due to excess speed and often because 2 people were pushing/pulling the truck when only 1 was controlling it.

108. Collisions occurred with fixed objects, moving trucks and objects that subsequently moved and struck others.

Articulated steer (masted)

109. One collision was investigated that involved an articulated-steer, masted truck. An operative was order picking in a warehouse aisle using a pedestrian propelled truck. The pedestrian truck was struck by the articulated steer truck that was travelling down the aisle.

Side reach

110. One accident was investigated in which the driver of the truck dismounted when the truck was coming to a halt and was trapped between the truck and a wall. Excess speed was given as a causal factor.

Order picker (man-up)

111. One accident was investigated in which a man-up truck was stationary while the driver was order picking in a warehouse aisle. A second order picker reversed down the aisle and collided with the stationary one. Causal factors given were that the driver of the travelling truck did not look round or use the mirror provided on the truck.

Ergonomic

Pedestrian propelled

112. Of the 7 accidents/incidents investigated 5 (71%) involved pedestrian propelled trucks. All but one of the accidents/incidents involved overstress injuries when pulling trucks on uneven or slippery surfaces. The other one was attributed to an overloaded truck.

Counterbalance

113. The 2 accidents/incidents investigated on counterbalance trucks involved a twisted back when the truck was driven over a pothole and whiplash injuries when the truck skidded and hit a wall. In both cases the driver was injured.

Explosion/harmful release

Explosion

114. Fourteen accidents/incidents were investigated. Battery explosions on electric trucks or split rim wheels bursting apart when tyres were

being replaced or wheels removed from the truck (usually by a visiting tyre fitter rather than a FLT service engineer) resulted in accidents. Accidents also occurred when the truck was in use and the locking ring flew off because the wheel had been incorrectly assembled.

115. Six (43%) of the total number of accidents investigated involved wheel failures. These accidents occurred when split rim wheels were being inflated prior to the wheel being fitted to the truck or when an incorrectly assembled split rim wheel was being removed from a truck. Two accidents occurred when incorrectly fitted locking rings were ejected from wheels while tyres were being inflated or trucks were in use. All involved counterbalanced trucks.

116. Eight (57%) of the total number of accidents/incidents investigated involved battery explosions. Four (50%) of these accidents/incidents occurred during battery charging because operatives or drivers placed or dropped metal objects on top of the batteries or a loose connection or exposed cable caused a spark that ignited hydrogen given off by the charging process. Two (25%) occurred when vehicles were being jump started. And two (25%) when trucks were being driven soon after battery charging and a loose connection caused sparks that ignited hydrogen given off by the batteries.

117. Generally, battery explosions were investigated on counterbalance trucks. However, one was investigated on a side loader that was being jump started and another on an order picker while it was being charged.

Harmful release

118. Fifteen harmful release accidents/incidents were investigated. All involved counterbalance trucks and thirteen (87% of the total) involved LPG powered trucks.

119. Seven (47%) of the harmful release accident/incidents involved carbon monoxide poisoning of drivers or pedestrian/operatives when trucks were used in poorly ventilated areas such as cold stores.

120. Five (33%) occurred during refuelling/recharging operations. Four (80%) of these accidents/incidents involved freeze burns to the driver or operative when they were disconnecting the LPG hose from the truck cylinder.

121. One accident/incident involved fume build up in the operator's position of an electric powered truck after the battery had been recharged and another leaking transmission oil catching fire when the truck was in use.

Fall from height

122. Fifty four falls from a height exceeding 2m were investigated. Forty seven (87%) of these accidents involved fatal or major injuries.

123. Forty six (87%) of the investigated accidents involved counterbalance trucks, five (9%) variable reach trucks and two (4%) reach trucks.

124. In fifty (93%) of the accidents investigated the person who fell was either standing on an object such as a pallet or stillage on the forks, standing on the forks or standing in an unspecified platform that was not secured to the forks.

125. Three accidents were investigated on working platforms that were being improperly used. In two of these accidents the platform door had been opened to allow the raised operatives to step in and out of the platform to access racking or to empty waste into a skip. In the third the truck was travelling with the platform raised when it struck an up and over door.

126. One accident was investigated when a proper platform was being properly used. This accident occurred due to mechanical failure when the lift cylinder detached from the triplex mast on the truck while the platform was raised. This caused collapse of the mast.

Loss of control

127. Twelve accident/incidents investigated were attributed to the driver loosing control of the truck. Five (42%) of the accidents/incidents involved fatal and major injuries to drivers. Three (25%) were dangerous occurrences

Counterbalance

128. Seven (58%) of the accident/incidents investigated involved counterbalance trucks. Travelling and turning on downhill gradients and slippery surfaces were given as causal factors in 3 (43%) of these accident/incidents. Failures or faults in the truck's braking or transmission system were given as causal factors in 3 (43%) of the accidents/incidents. Lack of maintenance was given as a causal factor in 2 accident/incidents.

129. Excess speed was given as a causal factor in one accident but this was in combination with a slippery surface on which the truck was turning while travelling.

Pedestrian controlled

130. Two accident/incidents were investigated involved trucks being manoeuvred by pedestrian operators. The drivers in both accident/incidents held onto the tiller after loosing control. In both

accident/incidents lack of driver training was given as a causal factor.

131. One accident/incident occurred when a ride on truck was travelling and swerved to avoid a collision with a fixed object. Excess speed was given as a causal factor.

Reach
132. In the only accident/incident investigated on a reach truck, the driver dismounted when control was lost as the truck was turning and travelling forwards at speed.

Variable reach
133. One fatal accident was investigated on a variable reach truck. The accident occurred because the brakes were ineffective due to a missing brake pipe that had not been replaced when the truck was last maintained. The driver lost control on a downhill gradient.

Mechanical failure/fault
Counterbalance
134. Forty accident/incidents were investigated on counterbalance trucks. Drivers were injured in 6 (15%) of these accident/incidents, pedestrian/operatives in 5 (13%) and a lorry/visiting driver in 1 (3%). Dangerous occurrences accounted for 70% of these accident/incidents.

135. There were no consistent causal factors associated with these accident/incidents. However, ineffective maintenance was given as a causal factor in 7 (18%) of accident/incidents.

136. Different parts and the number of times failure/faults were investigated along with their percentage of the total number of mechanical failure/fault accident/incidents investigated are given below:

- chain anchorage 9 (23%)
- mast/carriage 7 (18%)
- attachment 7 (18%)
- fork 3 (8%)
- lift/tilt mechanism 3 (8%)
- braking system 3 (8%)
- steering system 3 (8%)
- transmission system 2 (5%)
- trailer/container floor 2 (5%)

Reach
137. Six mechanical failure/faults were investigated on reach trucks. Three involved mast failures, one due to mast lift hose failure, another when a mast reach mechanism pulled out of its guides and the third when a mast upright fractured. Another involved chain failure due to lack of lubrication. In 2 of these accident/incidents the driver was injured.

138. An electrical fault in the truck transmission caused injury to a driver and a pedestrian was injured when a jib attachment fell off because it had not been properly secured.

Order picker
139. Three accidents occurred due to mast or lifting frame failures.

Pedestrian propelled
140. A truck driver was injured while operating a ride-on truck when the van floor on which the truck was travelling collapsed.

Variable reach
141. A boom lift pin failure resulted in a dangerous occurrence.

Container handler
142. A driver was injured when the truck brakes failed and the truck ran into a stack.

Articulated steer (masted)
143. A dangerous occurrence occurred when the welds on a shift carriage failed.

Contact with overhead electricity
Counterbalance
144. One dangerous occurrence involving contact with overhead electricity was investigated in which a counterbalance truck mast was raised for maintenance purposes while the truck was stationary.

All-terrain
145. An all-terrain masted truck was travelling on a construction site with a fully extended mast so as to carry a suspended load and contacted overhead electricity.

Overturn
146. Although overturn accounted for only 174 (14%) of all accident/incidents investigated it accounted for 16 (30 %) of all fatal accidents.

147. Annex 16 gives a breakdown of the numbers of overturning accidents/dangerous occurrences against the nature of overturn and truck type involved.

148. Lateral overturn accounted for 85% of overturning accidents/incidents, forward 15% and rearward less than 1%.

149. The reasons for lateral overturns varied with the type of truck.

150. Rearward overturn occurred in only 1 accident when a counterbalance truck was reversed over the edge of a loading bay.

151. On all trucks forward overturns usually occurred due to overload. They also occurred when masted trucks hit overhead objects while travelling or when a load close to the actual capacity of the truck was being carried and it moved on the forks effectively overloading the truck.

152. Variable reach trucks accounted for 15% of all overturning accident/incidents and 16% of the overall trucks in use. However, 67% of overturning accidents/incidents on this type of truck were dangerous occurrences.

153. All-terrain, container handler, pedestrian controlled, reach, side loader and side reach trucks accounted for 14% of all overturning accidents/incidents and 33% of the total number of trucks in use.

154. Only 7 (4%) accident/incidents involved pedestrians, one being a visiting lorry driver.

Counterbalance

155. Counterbalance trucks accounted for 70% of all overturning accidents/incidents although they represented only 47% of the total number of trucks in use. Of the 122 accidents/incidents investigated 103 (84%) involved lateral overturn, 18 (15%) involved forward overturn and only 1 accident (1%) involved a rearward overturn. This occurred when a truck reversed off the edge of a loading bay.

Forward overturn

156. On this type of truck 83% of forward overturns investigated involved dangerous occurrences. Only 6% involved major injuries and no fatal accidents were investigated. It seems likely that the risk of injury in a forward overturn is substantially less than in a lateral overturn. Nevertheless major injuries did occur.

157. Forward overturns in loading/unloading operations occurred primarily because the trucks were operating with a raised load and overload often occurred when the mast was tilted forward. Accidents/incidents were recorded on flat and level surfaces and, sometimes, when the trucks started to descend a downhill slope. A common reason for these accidents was the load slipping forward on the forks when the mast was tilted forwards. One such accident occurred when a truck was parked on a level surface and the mast tilted forward with the forks at full height while supporting a skip.

158. Two dangerous occurrences involving forward overturn occurred when picking loads off racking. One when the load was being picked off the racking with the mast at full height and one when the forks caught in the racking as the truck reversed. The catching of the forks caused the mast to oscillate in forward/reverse direction as the forks released from the load/racking thus causing dynamic overload. Dynamic overload also occurred when a truck was driven away from a stationary position in reverse with a bottom delivery hopper supported by the forks.

159. Two dangerous occurrences involving forward overturn occurred when trucks were travelling in reverse and their raised masts struck overhead objects.

160. One dangerous occurrence occurred due to a skip being loaded while on the forks of a parked truck leading to overload and forward overtun of the truck.

Rear*ward overturn*

161. Rearward overturn was investigated in only one accident/incident. This occurred when a counterbalance truck reversed over the edge of a loading bay.

Lateral overturn

162. A total of 103 lateral overturning accidents/incidents occurred on counterbalance trucks. Also, this type of accident accounted 84% of all overturning accidents/incidents on counterbalance trucks.

163. The majority of lateral overturns occurred when trucks were travelling between 2 locations. Turning with a raised load and turning sharply were given as causal factors in a significant number of these overturns. Excess speed was also given as a causal factor in 43% of these accidents/incidents when trucks were turning. However, it was rarely mentioned in accident/incidents when the truck was travelling but not turning.

164. Fatal injuries were sustained in 9 (9%) of lateral overturns. Fatal injuries often occurred when the driver tried to jump clear of the truck as it overturned and they got trapped between the truck and the ground.

165. Seventeen (10% of the total number of overturning accident/incidents) occurred when lorries or trailers drove away and caught the truck forks or load during loading/unloading operations. In 35% of these accidents the driver generally incurred over 3 day injuries. However, 1 fatal and 1

major accident were investigated.

166. Loss of control when travelling forwards down ramps or overload when reversing up ramps accounted for 17% of accidents/incidents involving counterbalanced trucks. Overturns occurred on fixed ramps/inclines, mobile lorry loading ramps and ramps leading into ships holds at docks. Causal factors were slippery ramps and the truck being braked and turning on the ramp.

167. Driving over potholes or uneven ground when trucks were turning while travelling was given as a contributory factor in 14% of overturning accidents/incidents.

168. Overturning accidents/incidents on counterbalance trucks occurred on level ground as well as uneven ground and gradients.

Variable reach

169. A total of 27 overturning accidents/incidents were investigated on variable reach trucks. This equates to 15% of all overturning accident/incidents on all types of truck. Dangerous occurrences accounted for 18 (67%) accident/incidents on variable reach trucks.

170. Drivers were involved in 7 (78%) of the 9 overturning accidents that resulted in injury. Fatal or major injuries were sustained in 67% of these accidents. Two pedestrians suffered major injuries in overturns during loading/unloading operations

171. Travelling, manoeuvring or reversing with a raised load or turning unladen with the boom raised were given as causal factors in 15 (56%) of overturning accidents/incidents involving variable reach trucks. Handling dynamic loads when manoeuvring or travelling was given as a causal factor in 27% of these accident/incidents.

172. Soft and uneven ground or potholes/edges were given as causal factors in 67% of accidents/incidents when trucks were travelling or turning while travelling

173. Eight, i.e. 30% of the total number of overturning accident/incidents on variable reach trucks, occurred when trucks were carrying out loading/unloading operations and when they were lifting lowering loads when stationary. Soft ground and gradients were given as causal factors when trucks overturned laterally as the boom was extended. Often, trucks were placing objects on or removing objects from scaffolding when overturn occurred. In one accident the truck was not handling a load, i.e. it was not loaded, when the boom was extended.

174. Gradients and overload were given as causal factors in 88% of the loading/unloading accidents/incidents investigated and when trucks were stationary carrying out lifting operations. Level consolidated ground was not mentioned in any of the accidents/incidents. Although trucks were overloaded longitudinally they often turned over laterally because they sunk into soft ground or they were being operated on gradients.

175. In the 6 accidents when trucks were manoeuvring 5 (83%) involved trucks operating on gradients. The other involved the truck being driven off a roadway into unmade ground.

176. One lateral overturn occurred when a passing vehicle struck the raised boom of a parked truck.

Pedestrian controlled

177. Seven accident/incidents involved pedestrian controlled trucks (6 stackers and 1 pallet). Accident/incidents were attributed in general to lateral overturns that occurred when stacker trucks were being manoeuvred or turned with the load raised. Only 1 of these accidents involved injury, i.e. an over 3 day injury, to the driver.

178. Five (71%) of the seven accidents/incidents involving overturn were dangerous occurrences and only 1 involved a major injury. This occurred when a pallet truck was descending a ramp and the driver braked and swerved to avoid running into a doorway. This would indicate that the risk of injury in a pedestrian controlled truck overturn is substantially less than on other types of powered truck.

All-terrain

179. Lateral overturns occurred when trucks were travelling or tuning on slopes. In 5 (83%) of the 6 accidents/incidents investigated the driver was injured and in 2 accidents they suffered major injury. There were no fatalities.

180. Downhill gradients were given as causal factors in 4 (67%) along with braking system failures in 3 (50%) of the 6 accidents/incidents investigated. Lack of maintenance was given as a causal factor in 2 (33%) of the accidents/incidents and 1 dangerous occurrence occurred due to lack of traction when a truck was descending a slope in adverse weather conditions.

Reach

181. All 4 accidents/incidents investigated on reach trucks involved forward overturn due to overload. Typically the truck tipped forward when the mast was overloaded in an extended position.

182. Drivers sustained injuries in 2 accidents as the truck rear wheels impacted the ground after the load slid off the forks as the truck overturned and when the truck suddenly tipped forward during loading/unloading or stacking operations and the driver was flung out of the truck cab.

Container handler

183. Four accident/incidents were investigated. In 2 (50%) of accident/incidents the driver was injured. The other 2 involved dangerous occurrences.

184. In all 4 accident/incidents the trucks were turning with raised containers. In 1 the container contained water making it into a dynamic load. In 2 others the truck hit a pothole while turning and in the forth the mast was tilted forward while descending a slight incline.

Side loader

185. Three accidents/incidents were investigated on side loaders. In one an unladen truck was negotiating a tight turn. Uneven ground was given as a contributory factor. In the second mechanical failure of the tilt ram mechanism caused the ram to dig into the ground while the truck was turning. In the third the truck slid off a ramp while being unload from a low loader.

186. In all 3 accidents the driver was injured. Two accidents involved major injury.

Side reach

187. One accident was investigated on a side loader. The truck overturned when it was travelling due to being overloaded by a truck mast that was suspended from the forks. The nature of suspension made the mast into a dynamic load and the forks were at full height.

Slip/trip/fall

188. Of the 40 accidents/incidents involving slips/trips/falls 33 (83%) involved counterbalanced, 4 (10%) pedestrian controlled, 2 (5%) pedestrian propelled and 1(2%) all-terrain trucks. The driver was injured in 24 (60%) of these accidents and pedestrian/operatives in 10 (25%).

189. Two accidents (5%) involved fatalities, 20 (50%) major injuries, 16 (40%) over 3 day injuries and 2 (5%) dangerous occurrences.

Waste disposal

190. Sixteen accident/incidents occurred when the truck was stationary. Eleven of these accidents involved people falling from the forks or objects on the forks while unloading waste from the truck.

191. A total of 69% of lifting/lowering load accident/incidents involved waste disposal. Two of these accident/incidents involved fatal accidents to people who fell while standing on the forks or an object on the forks of the truck in order to empty waste into skips. A further 9 major or over 3 day accidents occurred when people were standing on the forks or objects on the forks for the same reason.

192. Accident/incidents occurred when the people fell from the forks or because objects on the forks overbalanced or slid off the forks while the people were standing on them.

Working on lorry back/ramps/dock levellers

193. Thirteen (35%) accident/incidents occurred when counterbalance and pedestrian controlled trucks were operating on lorry backs, dock levellers or mobile ramps. Accidents occurred when the lorry and ramp or dock leveller moved apart and the truck fell into the gap created.

194. Causal factors associated with these accidents were that:

- the lorry drove away while being loaded,
- the lorry/trailer moved because the parking brake had not been applied when pallets were being pushed onto it,
- the rotating truck wheels pushed the lorry/trailer away from the ramp or dock leveller while the truck was reversing off it, and
- mobile ramps were pushed away from lorries/trailers by the rotating trucks wheels as the truck drove forwards off the ramp and onto the lorry/trailer back.

195. One accident/incident occurred when a pedestrian propelled pallet truck was being pulled/pushed onto a lorry back and the lorry drove away.

Passengers

196. Five people were injured when they were standing on objects that fell from the forks or they fell while standing on the forks of a travelling or manoeuvring truck.

197. Two accidents involved passengers who fell off while standing on the load to balance it as the load was lifted or when the truck was moved under power from a stationary position.

198. A lorry/visiting driver was injured when he jumped onto and fell off the forks of a moving truck. An operative was injured when he fell of the counterweight of a truck while balancing the load being lifted.

Struck by carriage or fork

Counterbalance

199. Two accidents were investigated. In both accidents over 3 day injuries were sustained when the fork fell onto the persons foot who was changing it. The end stops were missing from the carriage in both accidents.

200. A dangerous occurrence occurred when the side shift fell off a truck while it was lifting/lowering a load. Lack of maintenance led to mechanical failure of the mast/side shift.

All-terrain

201. A pedestrian/operative suffered major injuries when struck by the falling mast of a truck. Improper use of the truck caused the lift/tilt mechanism to fail.

202. A driver dropped a fork onto his foot while removing it from the fork carriage. The weight of the fork was probably a causal factor.

Struck by falling load

203. A total of 92 accident/incidents were investigated in which people were struck by loads that fell from trucks.

204. Struck by falling load accounted for 9 (17%) of all fatal accidents.

205. Pedestrian/operatives were injured in 72% of accidents investigated, drivers 15%, lorry/visiting drivers 9%, maintenance personnel 2%. The remaining 2% of accidents involved 1 accident to a member of the public in a scrap yard when a load fell from a travelling truck and 1 involving a passenger who was standing on a long load on the forks of a travelling truck with the intention of steadying it.. The number of accidents to different people and overall proportions by severity of injury are given below:-

Nature of accident	Number of accidents by severity (%)		
	Fatal	Major	Over 3 day
Pedestrian/operative	6	21	36
Truck driver	2	7	4
Lorry/visiting driver	1	6	1
Maintenance personnel		2	
Passenger		1	
Public		1	
Proportion of accidents by severity (%)	**10**	**43**	**47**

206. Lifting and handling unstable or unbalanced and, often, long loads were identified as causal factors in 65% of accident/incidents investigated.

Counterbalance

207. Counterbalance trucks were involved in 71 (77%) of the accident/incidents investigated. This is a disproportionately high number of accident/incidents compared with the number of trucks in use. Counterbalance trucks represent 49% of the overall truck population.

208. Of the 71 accident/incidents on counterbalance trucks 27 (38%) occurred when trucks were travelling. People walking close by trucks while steadying the load were given as causal factors in 7 (26%) of these travelling accidents. Loads falling from the forks when trucks are travelling on gradients and uneven ground or when they drove over objects/debris on the ground were given as causal factors in 6 (22%) accidents.

209. Twenty two (31%) of accident/incidents on counterbalance trucks occurred while they were stationary or parked and lifting/lowering unstable loads that fell. Causal factors in these accident/incidents were:

- handling long, high or unbalanced loads, such as metal fabrications, pipes and steel sections and machinery;
- the forks of the truck not being adjusted to an appropriate width for handling the load;
- the load slipping off the forks when the mast was tilted forward because inappropriate lifting techniques were used, e.g. a chain sling looped over a fork or an attachment that was not properly secured to the forks; and
- overload that caused the truck to tip forward.

210. Seventeen (24%) of accident/incidents occurred when unstable loads fell from trucks in loading/unloading or manoeuvring operations. Lorry/visiting drivers were injured in 7 (41%) of these accidents.

Pedestrian propelled

211. Six accident/incidents occurred while handling unstable loads using pedestrian propelled trucks. Causal factors were high loads and pulling or pushing trucks over uneven floors and gradients.

Variable reach

212. Variable reach trucks were involved in 5 (5%) of accident/incidents investigated. There were no consistent reasons for these accident/incidents.

Side loader

213. All 4 accident/incidents investigated on side loaders occurred while they were handling long or

out of balance loads in a stationary position.

214. Three pedestrian/operatives and one driver were injured when they were close to the truck and the loads fell from the raised forks. In one of these accidents another side loader was being lifted and in another boarding overbalanced because it was too large to be handled by the length of forks on the side loader. The driver was injured after dismounting from the truck.

Reach

215. Three accident/incidents were investigated. One involved a high load falling from a truck during loading/unloading operations because the forks were set too close together. Another involved injury to an operative when press parts overbalanced on the forks while the operative was trying to steady the load as it was being removed from the press. The third occurred when the mast of a truck hit an overhead door lintel while the truck was travelling.

Pedestrian controlled

216. A pedestrian/operative was injured while trying to steady a load as the truck was driven onto a lorry.

Container handler

217. A container was dropped by a container handler during stacking operations because a hydraulic fault prevented full twistlock engagement when the container was lifted.

Struck by moving truck

218. Struck by a moving truck was the most likely cause of accident. It accounted for 524 accident/incidents, i.e. 44% of the total accident/incidents investigated, and 52% of struck by moving truck accident/incidents involved fatal or major injuries. Additionally, 15 (28%) of all fatal and 257 (48%) of all major injury accident/incidents investigated involved people being struck by moving trucks. Clearly, people being struck by a moving truck accounts for a highly significant proportion of all investigated truck accidents.

219. Excluding dangerous occurrences, pedestrians were involved in 77% of struck by moving truck accidents, driver/operators 12%, lorry/visiting drivers 7%, passengers 3% and maintenance personnel 1%.

220. The numbers of struck by moving truck accidents, excluding dangerous occurrences, compared with the overall number of accidents for each truck type are given below:-

Type of truck	Total no. of	Struck-by (moving truck)	
		No. of accidents	Proportion of struck by (%)
All-terrain	17	9	53
Articulated steer (masted)	1	0	-
Container handler	4	0	-
Counterbalance	812	417	51
Order picker	6	2	33
Pedestrian controlled	71	23	32
Pedestrian propelled	30	9	30
Reach	48	20	42
Side loader	22	7	32
Side reach	6	5	83
Variable reach	52	31	60

221. Variable reach and all-terrain trucks had the highest percentage of struck-by moving truck accidents attributed to them (nominally 50-60% on each). These trucks are intended for rough terrain use and are widely used in house building and agriculture.

222. Counterbalance trucks are used in a wide variety of industrial sectors inside and outside for general materials handling purposes. Nominally 50% of accidents investigated on these trucks involved people being struck by moving trucks.

223. A generally lower proportion (30-40%) of struck by moving truck accidents occurred on reach, order picking, pedestrian controlled and pedestrian propelled trucks compared with the overall numbers for each truck type. These trucks are widely used in warehouses and storage areas involving goods in and goods out areas operations and, with the exception of order picking trucks, are also used in production environments where both pedestrian and truck movements are likely to be frequent.

224. It is likely that the nature of site, factory or warehouse controls combined with the design of truck has a strong influence on the number of struck by moving truck accident/incidents in the different environments in which they are used.

Counterbalance

225. Counterbalance trucks accounted for 8 (15%) of all fatal and 207 (39%) of all major injury accidents investigated on all truck types. Also, they were involved in 80% of struck by moving truck accident/incidents investigated and accounted for 53% of fatal and 81% of major injuries in this type of accident. By comparison, nominally 49% of trucks in use are counterbalance.

Travelling or reversing

226. One hundred and sixty three (39%) of struck by moving counterbalance truck acci-

dent/incidents involved trucks that were travelling, either forwards or in reverse, or they were reversing a sufficient distance to be not classed as manoeuvring. These accidents were split into, approximately, 52% moving forwards and 48% moving in reverse.

227. Common areas where trucks were being used when accidents occurred are:

- yards;
- loading/unloading areas, such as loading bays and yards;
- vehicle routes, in warehouses and production areas;
- ends of aisles, in warehouses, goods-in & goods-out areas and storage yards;
- narrow route ways where pedestrians and trucks need to pass, e.g. vehicle ramps;
- doorways, through which vehicles pass;

228. The most common causal factors and number of times that they were given in accident reports are:

- workplace layout or rules, 72 (44%)
- passing through doorway /curtain, 35 (21%)
- people moving into the path of a truck, 33 (20%)
- visibility, 28 (17%)
- people walking/standing alongside moving trucks, 18 (11%)
- driving forwards with a loaded truck, 17 (10%)
- noisy or dark environment, 11 (7%)
- people steadying the load while the truck is moving, 9 (6%)
- dismounting from a moving truck, and 6 (4%)
- excess speed 5 (3%).

229. In the accidents that were attributed to lack of visibility the following were given as causal factors:-

Causal factor	Proportion of accidents in which causal factor referred to (%)
Drivers vision obscured by load carried	28
Truck passing through doorway/curtain or turning round blind corner	25
Injured person struck in narrow or congested vehicle route	17
Person moved in front of moving truck or truck that was about to start	16
Struck by reversing/turning truck	14

230. The number of people injured in struck by moving counterbalance truck accidents when trucks were travelling or reversing were pedestrians 143 (88%), visiting/lorry drivers 8 (5%), passengers 6 (4%), truck drivers 3 (2%), maintenance personnel 2 (1%) and members of the public 1 (<1%).

Loading/unloading, manoeuvring and stacking

231. Loading/unloading operations accounted for 47 accident/incidents. In these accident/incidents 28 pedestrians, 17 visiting/lorry drivers, 1 truck driver and 1 maintenance operative were injured.

232. Manoeuvring accounted for 32 accident/incidents. This equates to 8% of all struck by accident/incidents investigated on counterbalance trucks. In all of these accident/incidents pedestrians were injured.

233. Reversing trucks were identified as being involved in 47% of loading/unloading, 53% of manoeuvring, 100% of stacking accident/incidents. They were also identified as being involved in 52% of accident/incidents when trucks were moved under power from a stationary position and 53% of accident/incidents when trucks were turning.

234. In 2 accidents pedestrians were struck by reversing trucks involved in stacking operations. Workplace layout/rules were given as the predominant causal factor. Also, the same causal factor was identified by inspectors as being relevant in 16 (50%) of manoeuvring accident/incidents.

Stationary (powered movement)

235. A total of 92 accidents/incidents occurred when trucks were moved under power from stationary. This type of accident/incident represents 22% of all struck by accident/incidents on counterbalance trucks and 87% of these accidents involved pedestrians.

236. Pedestrians were injured by trucks reversing from stationary in 43 (47%) of the above accident/incidents. The most common causal factors associated with these accident/incidents and the numbers of times the causal factors were given in the accident summaries associated with these accidents are:

- workplace layout rules, 17 (40%)
- pedestrians being close to the truck when it moves, and 8 (19%)
- pedestrians moving into the path of the truck as it moves. 6 (14%)

237. In 21 (23%) accident/incidents when trucks were moved under power from a stationary position the trucks were moved from stationary on full or part lock. In all of these accident/incidents pe-

destrians were injured. In all but one of these accident/incidents the pedestrian injured was close to the truck talking to the driver or was approaching the truck when it moved. Pedestrians were injured through contact with the truck and being trapped against another object by the truck counterweight. Serious injuries were sustained when pedestrians were caught between a rear steered wheel of the truck and truck body and then run over.

238. Eleven (12%) accident/incidents were identified as occurring when drivers drove trucks forward from stationary positions. A further 5 (5%) accident/incidents occurred when trucks were moved under power from stationary in unspecified directions. Pedestrians standing close to the truck talking to the driver or approaching the truck as it moved were consistently given as causal factors in these accident/incidents.

239. Truck drivers were injured in 4 accidents. In three of these accidents drivers were reported as inadvertently contacting controls as they dismounted or when they were seated in the operating position with a limb positioned outside the cab. Operation of the control would have made the truck move causing the driver or their limb to be trapped against a fixed object

240. Lorry/visiting drivers were injured in 4 accidents. In 3 accidents the driver was struck when the truck started to move in reverse, under power, with the truck driver in control.

241. One accident occurred when a truck moved forward as a result of it being started by the person standing next to it. Another occurred when a person standing next to the truck revved it up causing movement from stationary. In both the parking brake was not applied.

242. Two maintenance personnel were injured when they were working on trucks without isolating the transmission power source. One occurred when a direction control was inadvertently contacted and the other when a direction contactor in the transmission system was inadvertently operated on an electric powered truck during maintenance work.

243. Two passengers were injured when they fell off trucks that were moved from stationary under the driver's control. One accident occurred when the truck moved in a forward direction and the other in reverse.

Moved from stationary (rolled away)

244. Inspectors investigated 38 accident/incidents (7% of all struck by moving truck accident/incidents) in which counterbalance trucks rolled away from a stationary position after drivers had dismounted from them.

245. Major injuries were sustained in 50% of the above accident/incidents and over 3 day injuries in 42%. Two dangerous occurrences occurred when trucks rolled away and struck fixed objects.

246. Truck drivers were injured in 29 (76%) accident/incidents, pedestrian/operatives in 6 (16%) and lorry/visiting drivers in 3 (8%).

247. Truck drivers, pedestrian/operatives and lorry/visiting drivers were injured when they were trapped between the truck that had rolled away and another vehicle or a fixed object. It is significant that a substantial proportion, i.e. 16 (37%), of these accident/incidents occurred when other vehicles were being loaded or unloaded.

248. The majority (84%) of accidents occurred because the driver did not apply or adequately apply the parking brake before leaving the operating position. Causal factors were given as drivers not applying the parking brake in 20 (53%) accident/incidents or not adequately applying the parking brake in 12 (32%) accident/incidents.

249. Gradients were given as causal factors in 16 (42%) accident/incidents. Leaving the truck ticking over after dismounting were given as a causal factor in 11 (29%) accident/incidents. By comparison, ineffective or inadequate maintenance were mentioned as causal factors in only 5 (13%) accident/incidents.

Turning (while travelling)

250. Counterbalance trucks that were turning while travelling, were identified as being involved in 39 (9%) of the total number of struck by accident/incidents investigated on this type of truck. These accident/incidents involved 1 fatal, 17 major and 21 over 3 day injuries.

251. Pedestrian/operatives were involved in 32 (82%), passengers in 3 (8%), truck drivers in 2 (5%) and lorry/visiting drivers in 2 (5%) of the above turning while travelling accidents.

252. Of the 32 turning accidents involving pedestrian/operatives 22 (69%) occurred when trucks were travelling forwards and 10 (31%) when they were reversing.

253. In the 22 accident/incidents when trucks were moving forwards 9 (41%) involved pedestrian/operatives being struck or trapped by the rear end/counterweight or run over by the rear wheel of the truck as it turned. In 6 of these accidents the pedestrian/operatives were along side the truck when it turned or they were approaching

the truck, often to make contact with the driver. In 5 of these accidents it was identified that the pedestrian/operative had moved into the path of the turning truck and in 7 accident/incidents workplace layout/rules were given as a causal factor.

254. In the 10 accident/incidents when trucks were turning while travelling in reverse 4 (40%) occurred as trucks passed through doorways or entrances and in 2 (50%) of these accident/incidents the doorways had plastic strip curtains suspended in them. In 3 other accident/incidents pedestrian/operatives moving into the path of reversing trucks were given as a causal factor and in 2 workplace layout/rules was given as a causal factor.

255. In the 3 accidents involving passengers they jumped off trucks while they were turning. Injuries were sustained when the passengers were struck/trapped by the rear wheel of the truck or they were trapped between the truck rear end/counterweight and a fixed object. Two of these accidents occurred in yards and all 3 occurred when the trucks were travelling forwards.

256. Both accidents to truck drivers occurred in yards when the trucks were travelling forwards. The drivers suffered over 3 day injuries when they swerved and collided with other vehicles. In one accident excess speed and lack of visibility, due to a high load being carried, were given as causal factors. In the other workplace layout/rules was given as the causal factor.

257. Both accidents involving lorry/visiting drivers occurred in yards. The lorry drivers were struck by trucks that turned around the ends of vehicles while the drivers were carrying out sheeting operations.

Truck on lorry back/ramp

258. Three lorry/visiting drivers were injured when they were standing in lorry backs while the lorry was being loaded.

259. One pedestrian/operative was injured while walking down a ramp as a truck reversed out of the lorry.

Variable reach

260. A total of 31 accidents (nominally 8 per year) were investigated that involved people being struck by variable reach trucks. Fatal injuries were sustained in 6 (19%) of these accidents, major injuries in 20 (65%) and over 3 day injuries in 5 (16%). This would indicate that, compared with other types of truck, struck by variable reach truck accidents are likely to result in a high proportion of fatal or major injuries.

261. The above accident/incidents involved 24 (77%) pedestrian/operatives, 6 (19%) truck drivers and 1 (3%) lorry/visiting driver.

262. In 19 (61%) of accident/incidents the trucks were moving under power in reverse, in 7 (23%) the trucks were moving forward under power and in 5 (16%) the trucks rolled away from a stationary position.

263. The most consistent single reason for accident/incidents was trucks being reversed under power from stationary. These 9 accident/incidents represented 21% of all struck by variable reach truck accident/incidents investigated. In these accident/incidents 8 pedestrian/operatives were injured when they were either in close proximity to the truck as it started to reverse or they moved or remained in the path of the truck as it reversed. In 1 accident a driver was injured when he dismounted and caught his clothes on the direction control causing the truck to move under power.

264. Seven accident/incidents (23% of all struck by variable reach truck accident/incidents investigated) involved pedestrian/operatives who were struck by trucks that were travelling in reverse or turning while travelling in reverse. Reversing out of site and narrow entrances or through congested sites were given as causal factors along with workplace layout/controls.

265. Six accident/incidents (19% of all struck by variable reach truck accident/incidents investigated) occurred when trucks were travelling forwards. A causal factor given in 2 accidents was lack of driver visibility due to the load being carried. In 2 of the other accident/incidents the people injured were either working or lying down on the edge of the traffic route that the truck was travelling on.

266. Four drivers who had dismounted from their trucks and a pedestrian were injured when trucks rolled away from stationary. This type of accident/incident represented 13% of all struck by variable reach truck accident/incidents. In all of these accidents the parking brake was inadequately or not set. Lack of maintenance was given as a causal factor in 4 accidents. In one of the accidents the truck bucket was raised and being loaded with rubble when the truck started to move. In another, the truck was held stationary on a slope by the lowered forks and someone raised the forks when standing adjacent to the truck.

267. Pedestrian/operatives were involved in 4 accident/incidents involving manoeuvring trucks. This type of accident/incident represents 13% of

the total number of struck by variable reach truck accident/incidents investigated. In 3 of these accident/incidents the truck was manoeuvring in reverse and in 2 of these accident/incidents the injured persons bent down behind the truck as it was reversing. In the third accident of this type the driver watching the forks with the boom raised as the truck was reversed was given as a causal factor.

Pedestrian controlled

268. Twenty three struck by pedestrian controlled truck accident/incidents were investigated. Eight (35%) of these accident/incidents occurred when the truck was being operated in pedestrian mode. Fifteen (65%) occurred when the truck was being operated in ride-on mode.

Pedestrian operated

269. All 8 accidents investigated involved trucks that were travelling or manoeuvring. Drivers were injured in 6 accidents and pedestrian/operatives in 2 there were no dangerous occurrences. Three of these accidents involved major and 5 over 3 day injuries.

270. Five (63%) of the above accident/incidents occurred when trucks ran on trapping the driver or a pedestrian/operative against another object after the driver had released the tiller. In two of these accidents a loose or badly adjusted brake micro switch was given as a causal factor along with a lack of or ineffective maintenance.

271. In 2 accident/incidents the driver was injured because they continued to hold onto the tiller after control was lost when they tripped or were walking alongside the truck.

272. One accident occurred because the driver lost control due to braking too late when approaching a fixed object in a charging area.

273. Workplace layout/rules combined with a noisy/dark environment were given as causal factors in one accident.

Ride-on

274. Fifteen accident/incidents were investigated (11 involved pedestrian/operatives and 4 drivers). Seven (64%) occurred when trucks were travelling.

275. Of the 15 accidents investigated 3 (20%) involved major injuries and 12 (80%) over 3 day injuries. There were no dangerous occurrences.

276. In 2 accidents when trucks were travelling drivers were injured when they stepped off as the trucks were coming to a halt. The trucks continued to move and the drivers were trapped against other objects.

277. In 5 accidents when trucks were travelling pedestrian/operatives were injured. In these accidents 3 occurred in production areas, 1 in a wide vehicle aisle and 1 in a loading bay. The predominant causal factors identified were:

- pedestrian/operatives stepping into the path of moving trucks combined with workplace layout/rules,
- the driver being distracted when travelling along the vehicle aisle, and
- lack of driver visibility due to a high load being carried.

278. One accident/incident occurred when the truck was being turned at the end of a racking aisle in a warehouse. Workplace layout/rules were given as the predominant causal factor.

279. In the 3 accident/incidents when the trucks were reversing 1 driver and 1 pedestrian were trapped against other vehicles and a passing truck struck a pedestrian. Workplace layout/rules and passing through a plastic curtain in a doorway were given as causal factors.

280. Four accidents were investigated in which 3 pedestrian/operatives and a truck driver were struck by trucks that were driven away from stationary under power (2 forwards and 2 reverse). Workplace layout/rules were given as causal factors along with lack of visibility in one accident/incident due to a high load on the truck. It was also evident that these accident/incidents were partly caused by the number of vehicles that were operating in the same area at the same time.

Reach

281. Twenty struck by reach truck accident/incidents were investigated. 16 (80%) involved pedestrian/operatives and 4 (20%) truck drivers.

282. Of the 20 struck by reach truck accidents 6 (30%) involved major injuries and 14 (70%) over 3 day injuries.

283. Fourteen i.e. 67% of the accident/incidents investigated, occurred when trucks were travelling, turning while travelling or reversing a significant distance. Pedestrian/operatives were injured iIn 11 accident/incidents and truck drivers in 3.

284. When trucks were travelling forwards, common causal factors were trucks passing through doorways/plastic curtains, people walking alongside trucks in vehicle routes and people stepping into the path of moving trucks.

285. The 2 accident/incidents that occurred when trucks were reversing occurred in narrow aisles.

286. In the 5 accident/incidents that occurred when trucks were turning, 2 occurred when drivers dismounted from moving trucks and they were trapped between the truck and another object as the truck ran on. In addition, a driver's foot was run over as he dismounted from a forward moving truck that was not turning.

287. Trucks being driven away from stationary positions were involved in 5 accident/incidents. In 3 accident/incidents the trucks were driven forward and in the other 2 backward. Pedestrian/operatives close to the trucks when they started to move were given as causal factors in 4 (80%) of these accident/incidents. Also, drivers being unfamiliar with the truck controls were given as contributory factors in 2 accident/incidents.

288. One accident/incident occurred to a driver when a truck rolled away non-powered from a stationary position on a slope because the parking brake had not been applied.

All-terrain

289. Ten accident/incidents were investigated in which 4 passengers, 4 pedestrian/operatives and 1 driver was injured.

290. Of the 10 accident/incidents investigated 7 (70%) involved major injuries, 2 (20%) over 3 day injuries and 1 (10%) a dangerous occurrence.

291. All 4 passengers were injured when they fell from the trucks on which they were riding. In 2 of these accident/incidents the passengers were trying to climb onto the driver's access steps to talk to the driver while the truck was travelling. In the other 2 they fell from the driver's access steps while riding on the truck.

292. One pedestrian/operative was injured when they were struck by the truck rear end as it turned while travelling at speed. Another pedestrian/operative was struck by the rear end of the truck when they moved away as the truck started up from stationary and was turned on full or part lock. A third pedestrian/operative was struck by a reversing truck in a dark environment.

293. The remaining accident/incident involved a driver who was run over by a truck that rolled away from stationary after the driver had left the operators position. The parking brake had been damaged previously due to it being left applied when the truck was being driven.

294. One accident involved a pedestrian/operative who was struck by a reversing truck that was manoeuvring and a dangerous occurrence occurred when a manoeuvring truck was driven over the edge of a bank.

Pedestrian propelled

295. In all 9 accident/incidents involving pedestrian propelled trucks the person who was propelling the truck (the driver) was injured.

296. Of the 9 accidents investigated 4 (44%) involved major injuries and 5 (56%) over 3 day injuries.

297. In 6 (67%) accident/incidents a moving powered truck struck the pedestrian truck driver or truck.

298. In 3 (33%) accident/incidents the pedestrian truck rolled on when the driver tried to stop it and they were trapped against another object or were run over.

Side loader

299. Seven accident/incidents were investigated of which 4 were identified as occurring in wood yards. Five (71%) occurred when trucks were travelling. Three of these accident/incidents occurred when pedestrian/operatives walked into the path of moving trucks and in only 1 of these accident/incidents was the truck identified as travelling in reverse. Workplace layout/rules were given as causal factors in 3 of these accident/incidents.

300. A pedestrian/operative was injured in a congested storage bay when they were trapped between the truck and a fixed object as the truck manoeuvred in reverse.

301. A driver was injured when a truck rolled away from stationary because the parking brake had not been adequately maintained.

302. Of the 7 accidents investigated 1 (14% involved fatal injuries, 5 (71%) major and 1 (14%) over 3 day.

Side reach

303. Five accidents were investigated. In all 5 accidents pedestrian/operatives were injured.

304. Of the 5 accident/incidents investigated 1 involved major injury. The other 5 involved over 3 day injuries.

305. In 3 accident/incidents trucks were turning while travelling forwards. In the other 2 they were

reversing.

306. In 3 accident/incidents when trucks were turning workplace layout/controls were given as a causal factor combined with the truck conducting a tight turn when the pedestrian/operative was close by the truck.

307. In the 2 accidents when the trucks were reversing one occurred when the truck drove through a plastic curtain in a doorway and other when the truck reversed with a pedestrian/operative close by.

Order picker

308. Two accident/incidents were investigated. Both involved reversing man-up order pickers one in an aisle, the other at an aisle end.

309. In both of the above accident/incidents pedestrian/operatives were injured and workplace layout/rules were given as causal factors.

Trapping/shearing/crushing

310. Fifty-two trapping/shearing/crushing accidents were investigated. No dangerous occurrences were investigated.

311. The total number of accidents comprised 5 (10%) fatal, 30 (58%) major and 17 (32%) over 3 day injuries.

Counterbalance

312. Counterbalance trucks were involved in 41 (79%) of accidents investigated, reach 4 (8%), pedestrian controlled 4(8%). The remaining 3 (5%) accidents involved 1 accident each on variable reach, side loader and container handler trucks.

313. All 5 fatal accidents and 77% of major injuries were sustained in accidents involving counterbalance trucks.

314. Twenty two (54%) of the accidents occurred when trucks were parked, 7 (17%) when travelling and 6 (15%) when lifting/lowering loads.

Mast/carriage trap

315. Fourteen accidents were investigated in which the driver, operative or maintenance operative were crushed between the mast and overhead guard or they were trapped by a descending fork carriage when reaching through the mast.

316. People being trapped between the mast and truck body/overhead guard accounted for 4 fatal accidents and, in total, 12 of the above 14 accidents. Of the 12 accidents involving mast trap, 9 (75%) involved fatal or major injuries. The other 2 accidents involved 1 fatal accident and 1 over 3 day accident when people reached through the mast and operated the lift/lower control causing the fork carriage to descend.

317. The causal factors associated with all mast trapping accidents were that the mast tilt controls were contacted when the truck engine was running. The injured person stood between the mast and overhead guard and contacted the control with their foot usually while standing on the truck dashboard. In these accidents drivers often climbed into the space between the mast and overhead guard to put objects or materials, like cardboard or cling film, over the top of the overhead guard to protect against rain when operating out of doors.

318. The two accidents involving people reaching through the mast occurred when the lift/lower control was contacted causing gravity descent of the carriage. In one accident a maintenance operative received fatal injuries and in the other a driver over 3 day injuries.

Trapping between truck & another object

319. Seven accidents occurred when drivers (6) or a passenger (1) trapped their hand or foot between the truck and another object when the truck was travelling. A common causal factor was that the driver was travelling with a limb outside the truck operating position/cab.

Truck lift mechanism

320. Four accidents were investigated when operatives trapped their hands in the truck lift mechanism while being raised or lowered on the forks or on an object on the forks. Not using a properly designed working platform and standing on the load to steady it were causal factors.

Waste disposal

321. Two accidents occurred when operatives were tipping waste skip attachments mounted on the forks. Both occurred when the skip was being returned from its tipping position to its travel position.

Reach

322. Four accident/incidents were investigated on reach trucks. Two involved operatives trapping their hands in the lifting mechanism when they were either lifted on the forks or were standing on the load to steady it while it was being lifted.

323. One accident involved a maintenance operative trapping their arm in the reach mechanism during maintenance operations.

324. One accident involved a person being trapped between a makeshift work platform that was elevated to allow work to be carried out at height and a fixed object when the truck reversed from stationary.

Pedestrian controlled

325. Three accidents were investigated in which 2 operatives and 1 passenger were trapped between the truck and another object. In one of these accidents the operative trapped their hand against some racking while being lifted in a working platform. In another an operative's foot was trapped between a descending load and the floor and in the third an operative was steadying a load being carried when the load moved and trapped them against another object while the truck was manoeuvring.

326. A driver of a ride-on truck was injured when he was trapped between a HGV and dock leveller because there was a gap between the dock leveller and the truck fell into it while reversing out of the truck back.

Variable reach

327. A person was picked up by the grab attachment on a variable reach truck when cutting baler twine. Causal factors for the accident were lack of communication and lack of workplace rules.

Side loader

328. A driver' trapped his hand between the lengths of timber being loaded onto the truck and the window frame because he had his hand outside the cab.

Container handler

329. An operative was injured while manually releasing a jammed sensor on a container handling spreader beam.

DISCUSSION

General

330. The survey identified that between 1 April 1997 and 31 March 2001 HSE inspectors investigated 1204 accident/incidents involving industrial lift trucks. These accident/incidents included 53 fatal, 532 major and 484 over 3 day injuries to people. It also identified 135 dangerous occurrences. This equates to nominally 1 accident/incident for every working day over this period.

331. The number of accident/incidents investigated is substantially lower than the actual number in practice because, in general, only the most severe and most frequent causes of accident are investigated. Also, only accidents investigated by HSE inspectors have been taken into account. Local authority inspectors investigate industrial truck accidents in the premises that they cover but no detailed data was available for the purposes of root cause analysis. Nevertheless, the data in this report gives a good indication of the relative numbers of the most serious accidents that are occurring and provides useful data to allow the most frequent and serious accidents to be addressed.

Nature of accidents

332. Fatal accidents occurred for the following reasons:

Type of accident	Proportion of accidents (%)
Overturn	30
Struck-by moving truck	28
Struck by falling load	17
Trapped by mast/overhead guard	9
Fall from height	6
Low fall (waste disposal)	4
Loss of control	2
Mechanical failure/fault	2
Truck contacted object that struck person	2
Total number of fatal accidents	53

333. Fatal and major accidents occurred for the following reasons:

Type of accident	Proportion of accidents (%)
Struck-by moving truck	46
Overturn	11
Struck by falling load	10
Fall from height	8
Trapping/shearing/crushing [incl. mast trap]	6
Collision with fixed object	5
Slip/trip/fall [incl. waste disposal]	4
Truck contacted object that struck person	2
Mechanical failure/fault	2
Collision with moving truck	2
Collision with stationary vehicle	1
Loss of control	1
CO release	1
Battery/wheel/tyre explosion	1
Collision (overhead object) [incl. door lintel]	1
Steering wheel kickback	<1
Struck by fork while being removed	<1
Total number of fatal & major accidents	585

334. It is worthy of note that 2 common reasons for accidents in the past have been reduced to less than 1% by the introduction of design safeguards that were brought about through technical requirements in design standards (i.e. steering wheel kickback and forks falling from the carriage during maintenance/setting operations).

People injured

335. The most common reasons for accidents to different classes of people were:

Pedestrian/operatives:
- Struck by moving truck
- Struck by falling load
- Fall from height greater than 2m
- Struck by object that truck contacted
- Trapped by a moving part of the truck or between the truck and another object
- Slip, trip or fall from height less than 2m

Drivers:
- Overturn
- Collision with fixed object or other vehicle
- Struck by moving truck
- Slip, trip or fall from height less than 2m
- Being trapped by a moving part of a truck or between a truck and another object
- Struck by falling load

Lorry/visiting drivers:
- Struck by moving vehicle
- Struck by falling load

Passengers
- Struck by moving vehicle
- Slip/trip/fall from height less than 2m
- Trapping/shearing/ crushing

Maintenance personnel
- Struck by moving truck
- Trapping/shearing/ crushing
- Explosion
- Struck by falling load

336. Members of the public were injured in 2 accidents; 1 when a truck was delivering to a duty free area on a dock and the other in a scrap yard. In both accidents the public mixed with trucks in areas where there was little to no control of public and vehicle movements. One trainer was injured when demonstrating the use of emergency rope egress equipment for use on a man-up order picker. It can be seen that the reasons for accidents to different groups of people vary.

337. The number of accidents to the different classes of people given above are:

Person	Fatal	Major	Over 3 day	Total
Pedestrian/operative	22	322	277	621
Driver	28	156	177	361
Lorry/visiting driver	3	28	18	49
Passenger		13	8	21
Maintenance personnel		10	4	14
Public		2		2
Trainer		1		1
Totals	**53**	**532**	**484**	**1069**

338. It is apparent that pedestrian/operatives, drivers and lorry visiting drivers are the people most at risk from serious injury.

Overturning

339. Although overturning accounted for only 14% of all accidents/incidents investigated it accounted for 30% of fatal accidents, i.e. the most frequent cause of fatal accidents. Together, counterbalance and variable reach trucks accounted for all fatal overturning accidents on trucks over the period of the survey. It can be concluded that overturning of counterbalance and variable reach trucks are a major cause of fatal accidents.

340. In 35% of overturning accident/incidents investigated inspectors reported that trucks were being operated by untrained drivers. This is a substantially higher percentage than was given for any other nature of accident/incident. This emphasises the importance of drivers being trained in the proper control and operation of trucks and understanding the stability limits associated with them.

Counterbalance

341. Overturning of counterbalance trucks accounted for 87% of all investigated fatal overturning accidents covered by the survey. A significant percentage (53%) of these overturning accidents involved lateral overturn when trucks were travelling or turning.

342. A consistent causal factor contributing to lateral overturning accidents was counterbalance trucks being turned while travelling at speed with the forks/carriage raised. Accidents also occurred when trucks were turned sharply on flat and level ground unloaded with the forks in the recommended travel position. Other contributory factors that encouraged overturn were turning or loss of control on gradients or ramps, turning at speed on uneven surfaces and trucks driving into potholes or over raised objects and trucks carrying dynamic or long unbalanced loads. Accidents commonly occurred when trucks were travelling between 2 locations or when they were manoeuvring, for example, in loading/unloading areas or in open areas, such as yards. Fatal accidents often occurred in lateral overturns when the driver tried to jump clear of the truck as it overturned and they got trapped between the truck mast or overhead guard and the ground.

343. Over the period of the survey 17 lateral overturns involving counterbalance trucks occurred during vehicle loading/unloading operations. Overturn occurred when the truck forks or load carried were contacted by the lorry being

loaded as it drove away. These accident/incidents often involved curtain sided lorries. Although, a high proportion of these accident/incidents (53%) involved dangerous occurrences a truck driver was fatally injured in 1 accident and in another a truck driver suffered major injuries. The likelihood of serious injuries in these accidents appears to be lower than in lateral overturns when trucks are travelling or manoeuvring indicating that drivers are less likely to be trapped between the truck and the ground in the event of overturn. Nevertheless there were 8 accidents (2 per year) in which people suffered injury.

344. A lorry/visiting driver was injured when a counterbalance truck tipped forward during loading operations trapping the driver between the truck and a lorry. In 3 accidents pedestrian/operatives were struck by travelling trucks as they overturned. This indicates that people other than the truck driver can be injured in truck overturns.

Variable reach

345. A high proportion (67%) of variable reach truck overturns involved dangerous occurrences. A further 22% of overturning accidents on variable reach trucks involved fatal or major injuries. This compares with equivalent figures of 40% dangerous occurrences and 43% fatal and major accidents for counterbalance trucks. It can be concluded that the likelihood of serious injury in a variable reach truck overturn is less than that associated with a counterbalance truck. However the risks are significant because 2 drivers suffered fatal, 2 major and 3 over 3 day injuries and 2 pedestrian/operatives received major injuries when variable reach trucks tipped forward or overturned laterally.

346. Forward and lateral overturns occurred when trucks were stationary, often when they were transferring loads from ground level to positions at height. Causal factors associated with these accidents were overload as the boom was extended while handling a load and wheels sinking into soft ground when raising and extending the boom in both loaded and unloaded conditions. A common factor that contributed to accidents was operating on cross gradients.

347. Lateral overturns occurred when trucks were travelling, manoeuvring, reversing and turning. Causal factors associated with these accidents were truck wheels being driven into excavations, ruts and soft ground. Other causal factors were trucks being operated, laden and unladen, on cross gradients and uneven ground with their booms raised and sometimes handling dynamic loads.

348. Two lateral overturns occurred when trucks were parked. In one the boom of a parked truck was struck by another passing vehicle causing the truck to overturn and in the other a truck that was parked on an uphill gradient ran away because the parking brake had not been set or was inadequately set.

All-terrain

349. Drivers suffered major and over 3 day injuries when all-terrain trucks overturned on slopes. Downhill slopes were commonly involved in accidents combined with braking system failures due to lack of maintenance and loss of control in adverse weather conditions.

Pedestrian controlled

350. Accident/incidents generally involved stacker trucks being turned with a raised load. Injuries to people occurred in only 1 accident. It seems likely that the risks are low on these trucks because drivers can step off the truck in the event of overturn. Nevertheless, risks exist for pedestrian/operatives and proper site controls are likely to be needed to control risks where these trucks have to negotiate blind and tight corners.

Reach

351. Reach trucks are unusual in that overturning risks usually relate to forward overturn. Particular care has to be exercised in ensuring that the truck is not overloaded and the load is stable when the forks/mast are extended, i.e. reached out and raised.

Container handlers, side loaders and side reach

352. These are covered in paragraphs 183 to 187 of this report.

Struck by moving truck

353. People being struck by moving trucks was the most frequent cause of accident investigated and the second most frequent cause of fatal accidents. There were 523 accidents for this reason and this equates to approximately 1 investigated accident every 2 working days over the period 1 April 1997 to 31 March 2001. A total of 49% of all fatal, major and over 3 day accidents occurred for this reason. It was highly significant that counterbalance trucks were involved in a disproportionately high percentage of these accidents (76%) although it is estimated that they comprise only 49% of all powered trucks in use.

354. Struck by moving truck accidents occurred on all types of truck. However, it was shown that the proportion of struck by moving truck acci-

dents investigated on each truck type varied, as follows:

- 50-60% variable reach and all-terrain,
- 50% counterbalance, and
- 30-40% warehouse trucks (excluding counterbalance)

This indicates that the nature of site, factory, or warehouse controls combined with truck design and the nature of use of trucks would appear to have a significant influence over the likelihood of a struck by accident occurring.

355. People were struck when trucks were:

- travelling between different locations,
- reversing,
- turning,
- starting to move under power from stationary positions
- involved in loading/unloading operations,
- manoeuvring, and
- stacking.

They also occurred when trucks rolled away from stationary positions, while parked on gradients and when they were left stationary on the level with the engine running.

Powered trucks under driver control

356. The direction of travel was not given in 22% of the investigated accidents that involved powered trucks being moved under the driver‘s control. Nevertheless, it was possible to identify that trucks being reversed while carrying out loading/unloading and stacking operations, manoeuvring to change direction and starting to move under power from a stationary position were involved in 24% of investigated struck by accidents in which the truck was moved under power by the driver. Also, it was significant that in 64% of these accidents trucks starting to move in reverse from a stationary position were given as a causal factor. In addition, trucks reversing, turning and travelling significant distances in reverse were identified as being involved in 20% of all struck by accidents when trucks were moved under power by the driver. It is apparent that trucks manoeuvring in both restricted and open areas and reversing significant distances are involved in a substantial number of accidents. Also, that trucks reversing and turning in reverse from stationary positions under power are involved in a significant proportion of accidents.

357. Trucks travelling forwards while manoeuvring to change direction and in loading/unloading and stacking operations and trucks travelling and turning while travelling in a forward direction were identified as being involved in 33% of all struck by accidents when trucks were being driven under driver control. Accidents occurred in particular when people moved into the path of moving trucks, when they were walking or standing close to the sides of trucks, particularly when the truck turned and when they were walking with the truck to steady the load as the truck was driven forwards.

358. Common areas where trucks were being used when accidents occurred are:

- loading/unloading areas;
- open areas, such as yards;
- vehicle routes, in warehouses and production areas;
- congested areas where vehicles and pedestrian/operatives mix (e.g. workshops);
- ends of aisles in warehouses, goods-in & goods-out and stock holding areas;
- narrow route ways where pedestrians and trucks need to pass, e.g. vehicle ramps and aisles in storage areas;
- doorways, through which vehicles pass;

359. In general, pedestrians were involved in 77% of struck by accidents, drivers 12%, lorry/visiting drivers 7%, passengers 3% and maintenance personnel 1%. These percentages change, however, depending on the truck operation at the time of the accident, for example, struck by accidents to lorry/visiting drivers occurred mainly during loading/unloading operations.

360. The reasons for and nature of struck by accidents vary with the type of truck involved, the operations being carried out and where it is used. Further details of struck by accidents investigated on different types of truck are given in paragraphs 219 to 310.

Trucks moving away from stationary positions not under driver control

361. Struck by moving truck accidents occurred on counterbalance, all-terrain, variable reach, reach and side loader trucks when they rolled away from stationary positions after the driver had alighted from the driving position. The majority of these accidents occurred on counterbalance trucks (83%) and also variable reach trucks (11%). The other types of truck were involved in 1 accident each.

362. A total of 46 accidents that occurred for the above reasons were investigated over the 4 year period of the survey and this equates to nearly 1 accident per month. These accidents involved 4 fatal, 20 major and 22 over 3 day injuries so they are of particular concern.

363. Struck by accidents occurred when trucks moved because the parking brakes had not been applied or adequately applied before the driver alighted. Trucks ran away when they were parked on gradients or when IC engine trucks

with torque converter drives were left running on tick over on the level.

Struck by falling load

364. Struck by falling load was the third most frequent reason for fatal accidents. It accounted for 9 fatal accidents (nominally 2 per year). Inspectors also investigated 48 major injury accidents (1 per month) over the period of the survey.

365. Pedestrian/operatives were injured in 72% of the accidents investigated often when they were steadying high, unbalanced or long loads when trucks were lifting or travelling with them. Common reasons for loads falling from forks were metal to metal contact that allowed the load supported or slung from the trucks to slip forward relatively easily when the mast was tilted and laterally because the forks were too close together for the length of load being carried.

366. All of the accidents to lorry/visiting drivers occurred during lorry loading operations. Unstable loads falling from the truck forks or lorry as they were being placed on or picked up from lorry backs were common reasons for these accidents.

Trapping/shearing/crushing

Mast/carriage trap

367. Four fatal accidents (1 per year) occurred when drivers and operatives climbed between the mast and overhead guard of counterbalance trucks, often to place materials on the overhead guard to protect the driver from rain when using the truck out of doors. This is a major cause of fatal accidents. A fatal accident also occurred when a maintenance operative reached through the mast of a counterbalance truck and contacted the mast lower control causing the carriage to descend under gravity.

Other trapping/shearing/crushing accidents

368. Trapping shearing crushing accidents occurred when operatives trapped their hands in the lifting mechanism while being lifted on the forks or objects on the forks of trucks. Operatives and drivers also trapped their hands when returning waste disposal skips mounted on trucks to their carrying position after tipping waste.

369. Additional information on trapping/shearing/crushing accidents is given in paragraphs 313 to 332.

Fall from height

370. Inspectors investigated 3 fatal and 44 major injury accidents involving falls from height over the period of the survey, i.e. 1 fatal or major injury accident every month between 1 April 1997 and 31 March 2001. This makes falls from height a major reason for serious injuries.

371. Falls from height occurred almost exclusively on counterbalance, variable reach or reach trucks and, generally, for the same reasons. A high percentage (93%) of accidents occurred when people were lifted on the trucks forks or an object on the forks such as a pallet or stillage. Only 1 accident occurred when a proper working platform was being used in accordance with the guidance given in HSE Guidance Note PM28 and this occurred due to mechanical failure of the truck mast.

372. The one accident that did not occur for the above reasons was when operatives were receiving training in rope egress techniques by an in-house trainer. The trainer fell to the floor while demonstrating the rope egress equipment and received major injuries. There was no failure of the rope egress equipment so this raises potential concerns over the specification of rope egress equipment on these machines and the competence requirements for trainers.

Slip/trip/fall

Waste disposal

373. Fatal, major and over 3 day accidents occurred when trucks were used for waste disposal purposes. Accidents generally occurred when drivers or operatives fell from less than 2 m height from the forks of trucks or objects on the forks while emptying waste into skips or other receptacles. A total of 14 accidents occurred of which 2 involved fatal and 9 major injuries. This is a significant reason for serious injuries with one fatal or major accident nominally every 4 months over the period of the survey.

Working on lorry backs/ramps/dock levellers

374. Counterbalance and pedestrian controlled trucks were involved in 13 accident/incidents that were investigated by inspectors between 1 April 1997 and 31 March 2001. Accidents occurred when lorries drove away while being loaded, lorries moved because their parking brakes had not been applied when pallets were being pushed on by a truck, the rotating truck wheels pushed the lorry/trailer and ramp or dock leveller apart while the truck was reversing off and mobile ramps were pushed away from lorries/trailers when trucks were driven off the ramp and onto the lorry/trailer.

Mechanical failure/fault

375. There were no consistent reasons for this type of accident/incident. However, ineffective maintenance was mentioned as a causal factor in

18% of accident/incidents investigated.

376. Of the 53 mechanical failure/fault accident/incidents investigated 64% involved dangerous occurrences and 17% fatal or major injuries. It can be concluded that the likelihood of serious injuries in this type of accident/incident is relatively low.

377. The majority of failure/faults investigated involved the lifting parts of trucks, e.g. chain anchorages, masts, attachments and forks. Failure/faults also occurred in braking and transmission systems and vehicle backs when trucks were running on them during loading/unloading operations.

Collision with

Fixed object

378. Drivers were often injured on seated trucks when they had their limbs outside the operator's position and on pedestrian controlled ride on trucks when their legs were trapped against raised objects as the truck was being manoeuvred or when the truck ran on after they dismounted. In addition, being trapped between the truck and another object either because the driver's limbs were outside the operator's position or because they were dismounting as the truck came to a halt was a common reason for accidents on reach trucks

379. A common reason for accidents was trucks striking vertical objects, such as columns and walls, when they were travelling or reversing and often when turning.

Moving vehicle

380. Collisions with other trucks often occurred in loading bays, yards, warehouses and stock holding areas. Trucks travelling through doorways around aisle ends, through and in congested thoroughfares and across vehicle crossings were often mentioned as contributing to the accident along with lack of workplace rules and poor driver visibility due to workplace layout. Driving forward with a large load obscuring the driver's vision was given as causal factor in some accidents.

Stationary vehicle

381. Accidents usually occurred when trucks were being manoeuvred while carrying out work activities in congested areas where other trucks or vehicles were parked.

Overhead object

382. The most common reason for accidents was truck masts striking raised roller shutter doors or door lintels while travelling in forward and reverse directions through doorways.

Object that moved and struck a person

384. Accidents often occurred in production and storage areas when objects were being picked up or deposited or when objects were positioned in or overhung traffic routes and they were struck by travelling trucks.

385. Pallets, bins and stacks that moved and contacted people or that collapsed or moved and contacted other objects as they were being picked up or deposited were involved in a number of accidents. Bins and other objects that were struck by passing trucks were also often involved in accidents.

Loss of control

386. Accidents due to loss of control often occurred when trucks were travelling on downhill gradients. Slippery surfaces were often mentioned in these accidents and accidents often occurred when the driver attempted to turn the truck while travelling downhill after control was lost.

387. Lack of maintenance leading to braking or transmission system failures were given as causal factors in a few accidents.

Harmful release

CO release

388. The majority of these accidents involved CO exhaust releases from LPG powered trucks when they were being used in poorly ventilated confined areas such as cold stores.

LPG release

389. Accidents usually occurred during refuelling operations as the LPG hose was disconnected from the truck cylinder.

Battery fumes

390. One driver suffered exposure to harmful fumes when he was operating a counterbalance truck immediately after it had been charged.

Explosion

Battery explosion

391. Accidents occurred in battery charging areas when operatives placed or dropped metal objects on top of batteries and when loose connections sparked. They also occurred on moving trucks due to loose connections that sparked when trucks were in use soon after their batteries had been charged.

392. A few battery explosions occurred when trucks were being jump started.

Tyre/wheel failures

393. Maintenance personnel and others were injured when split rim wheels separated violently while tyres were being replaced or the wheels were being removed from trucks. They also occurred when locking rings were ejected from incorrectly assembled split rim wheels that had been fitted to trucks in use. Visiting tyre fitters rather than authorised FLT service engineers were involved in a significant number of these accidents.

Steering wheel kickback

394. Only 2 accidents involved steering wheel kick back. This is a substantial reduction compared with the number that occurred in the past. Standard requirements that have encouraged the fitting of power steering on trucks have eliminated many of these accidents. One accident occurred as a result of a fault on the power steering unit and the other when the truck ran over a pothole while travelling on a roadway.

Struck by fork while being removed

395. Over 3 day injuries were sustained when forks were pulled off the end of the carriage while being adjusted for spacing or being removed. This is a small number of accidents and is likely to be so small because of standard requirements introduced previously for end stops on carriages to prevent forks from being inadvertently pulled off.

Ergonomic

396. Over stress injuries occurred when pedestrian propelled trucks were being moved on uneven or slippery surfaces, often with heavy loads on the trucks.

397. Drivers of counterbalance trucks received back injuries when they ran into potholes while reversing, i.e. with their backs twisted.

CONCLUSIONS

398. Over the period 1 April 1997 to 31 March 2001 HSE inspectors investigated 1204 accident/incidents involving industrial lift trucks. This represents nominally one investigated accident/incident for every working day over this period. The accidents investigated involved 53 fatal, 532 major and 484 over 3 day injuries to people. Pedestrians or operatives affected by industrial truck operations, truck drivers, lorry/visiting drivers, passengers on trucks and maintenance personnel were all involved as well as 1 member of the public. There were also 135 dangerous occurrences investigated. The majority (96%) of accidents investigated involved pedestrian/operatives, truck drivers and lorry visiting drivers.

399. The distribution of investigated accidents by severity shows that 5% involved fatal injuries, 50% major injuries and 45% over 3 day injuries. This shows a high proportion (55%) of serious injuries in the accidents investigated.

400. Comparing the numbers of accidents reported to HSE involving industrial lift trucks with the overall numbers of reported accidents for transport in general it can be seen that nominally 14.5% of transport accidents involve industrial lift trucks.

401. The ratio of fatal, major and over 3 day accidents was similar for both lift trucks and transport in general. This would indicate that the nature of accidents is a major influence on the nature of injuries sustained. Consequently, it is reasonable to suggest that common lessons can be learnt from similar types of accident on different types of works transport.

402. The most common reasons for accidents were:

- being struck by a moving truck (49%);
- collision with a fixed object, moving vehicle or an object that moved and struck a person (13%);
- overturn (9%);
- struck by falling load (8%);
- fall from height (5%);
- being trapped by a moving part of the truck or between the truck and another object (5%); and
- slip/trip/fall from a height of less than 2m (4%).

403. Most accidents investigated involved causal factors that can be addressed by different combinations of measures relating to truck design, management control, work organisation and the training of individuals. The common risk scenarios and corresponding causal factors identified in this report can assist in the identification of safety measures to protect against the different types of accident that commonly occur. However, the suite of appropriate measures to protect against different types of accident will vary with the accident scenario and the causal factors involved. Consequently it is important to take into account the nature of accident and the nature of truck operations along with likely causal factors that can lead to risk in order to identify suitable control measures.

404. The common risk scenarios and causal factors identified in this report were formulated using data obtained from HSE inspector's accident re-

ports. It was supplemented with intelligence gained from external stakeholders and knowledge obtained from HSE and industry working groups. Many issues are currently being taken forward by industry groups in order to bring about improvements in health and safety. Any strategic planning or initiatives within HSE will need to take account of these developments and, as necessary, developments in safeguarding techniques, the state-of-the-art in available safety measures and the likelihood of introducing workplace controls. It is likely that developments in workplace control measures will need to include training of truck drivers and others in the nature of hazards, causal factors associated with accidents and the level of risk involved.

Annex 1 Search Criteria for FLT Accidents

Databases: Focus

Period covered by search:
- 01/04/97 to 31/03/01

Key words for text searches (see following whole words):
- lift truck
- LT
- fork lift
- FL
- flt
- FLT truck
- counterbalance truck
- rough terrain truck
- variable reach truck
- telehandler
- telescopic handler
- RT
- reach truck
- side lift truck
- side loader
- side loading truck
- container handler
- container truck
- pedestrian truck
- pallet truck
- stacker truck
- order picker
- order picking truck

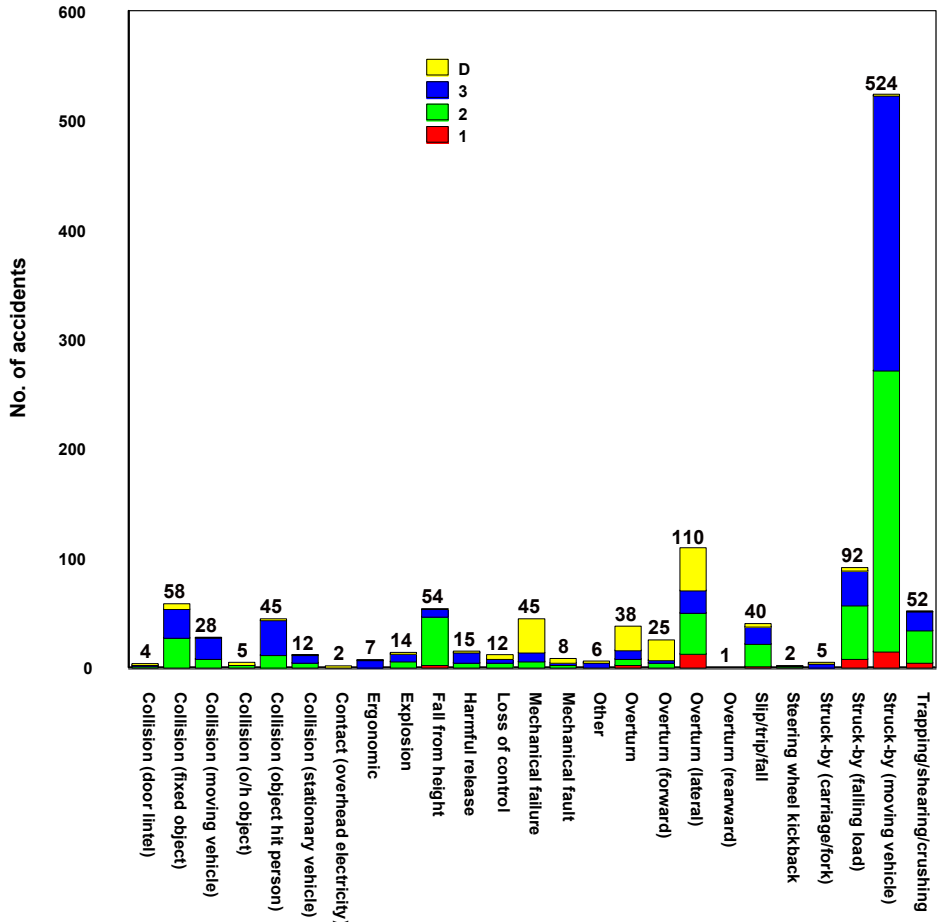
Annex 2 Number of trucks in use and accidents/incidents investigated

Type of truck		% of total truck population		Accidents & DOs investi-gated	Risk index	
		Truck	Type of truck			
All-terrain (masted)		3.2	3.2	19	5.9	
Articulated steer (masted)		-	-	2	-	
Container handler	Masted	-	-	7	-	
	Telescopic	-	-		-	
Counterbalanced (masted)	Electric 3 wheel	9.1	48.7	212	4.4	18.6
	Electric 4 wheel	7.5				
	LPG	13.4				
	Diesel	18.7				
FLT (not specified)		-	-	694	-	
Order picker	Not Specified	5.4	7.5	5	0.7	
	Man-up	2.1		3	0.4	
Pedestrian Controlled	Pallet	11.8	15.0	60	4.0	
	Stacker	3.2		17	1.1	
Pedestrian pro-pelled	Pallet	-	-	28	-	
	Stacker	-	-	2	-	
Reach		8.6	8.6	53	6.2	
Side loader		0.5	0.5	24	48.0	
Side reach		0.5	0.5	7	14.0	
Variable reach (rough terrain)		16.0	16.0	71	4.4	
Totals		**100**	**100**	**1204**		

NOTE : Risk index (powered trucks only) = $\frac{\text{Number of accidents}}{\text{\% of truck population}}$

Annex 3 Number of accidents/incidents by nature of accident (all trucks)

Key 1 = Fatal injury 2 = Major injury
3 = Over 3 day injury 4 = Dangerous occurrence (DO)



		Fatal	Major	Over 3 day	DO	Totals
Collision	Door lintel		2	1	1	4
	Fixed object		28	26	4	58
	Moving truck		9	19		28
	Overhead object		3		2	5
	Object hit person	1	11	32	1	45
	Stationary vehicle		5	7		12
Contact (o/h electricity)					2	2
Ergonomic				7		7
Explosion			6	7	1	14
Fall from height		3	44	7		54
Harmful release			4	9	1	14
Loss of control		1	4	4	3	12
Mechanical failure		1	5	8	31	45
Mechanical fault			3	2	3	8
Other				5	1	6
Overturn	Not specified	3	5	9	21	38
	Forward		5	2	18	25
	Lateral	13	28	20	39	110
	Rearward		1			1
Slip/trip/fall		2	20	16	2	40
Steering wheel kickback			2			2
Struck-by	Carriage/fork		1	3	1	5
	Moving truck	15	257	251	1	524
	Falling load	9	48	32	3	92
Trapping/shearing/crushing		5	30	17		52
Totals		53	532	484	135	1204

Annex 4 Percentage of accidents/incidents by nature of accident

a) **Percentage of total number of accidents/incidents**

		Fatal	Major	Over 3 day	DO	Totals	
Collision	Door lintel		0.2	2.2	0.3	0.4	12.6
	Fixed object		2.3	2.2	0.3	4.8	
	Moving truck		0.7	1.6		2.3	
	Overhead object		0.2		0.2	4.2	
	Object hit person	0.1	0.9	2.7	0.1	3.7	
	Stationary vehicle		0.4	0.6		1.0	
Contact (o/h electricity)							0.2
Ergonomic					0.6		0.6
Explosion				0.5	0.6		1.1
Fall from height		0.2	3.7	0.6			4.6
Harmful release			0.3	0.7	0.1		1.2
Loss of control		0.1	0.3	0.3	0.2		1.0
Mechanical failure		0.1	0.4	0.7	2.6		3.7
Mechanical fault			0.2	0.2	0.2		0.7
Other				0.4	0.1		0.5
Overturn	Not specified	0.2	0.4	0.7	1.7	3.2	14.5
	Forward		0.4	0.2	1.5	2.1	
	Lateral	1.1	2.3	1.7	3.2	9.1	
	Rearward		0.1		0.1	0.1	
Slip/trip/fall		0.2	1.7	1.3	0.2		3.3
Steering wheel kickback			0.2				0.2
Struck-by	Carriage/fork		0.1	0.2	0.1	0.4	51.6
	Moving truck	1.2	21.3	20.8	0.1	43.5	
	Falling load	0.7	4.0	0.2	0.2	7.6	
Trapping/shearing/crushing		0.4	2.5	1.4			4.3
Totals		4.4	44.2	40.2	11.2		100

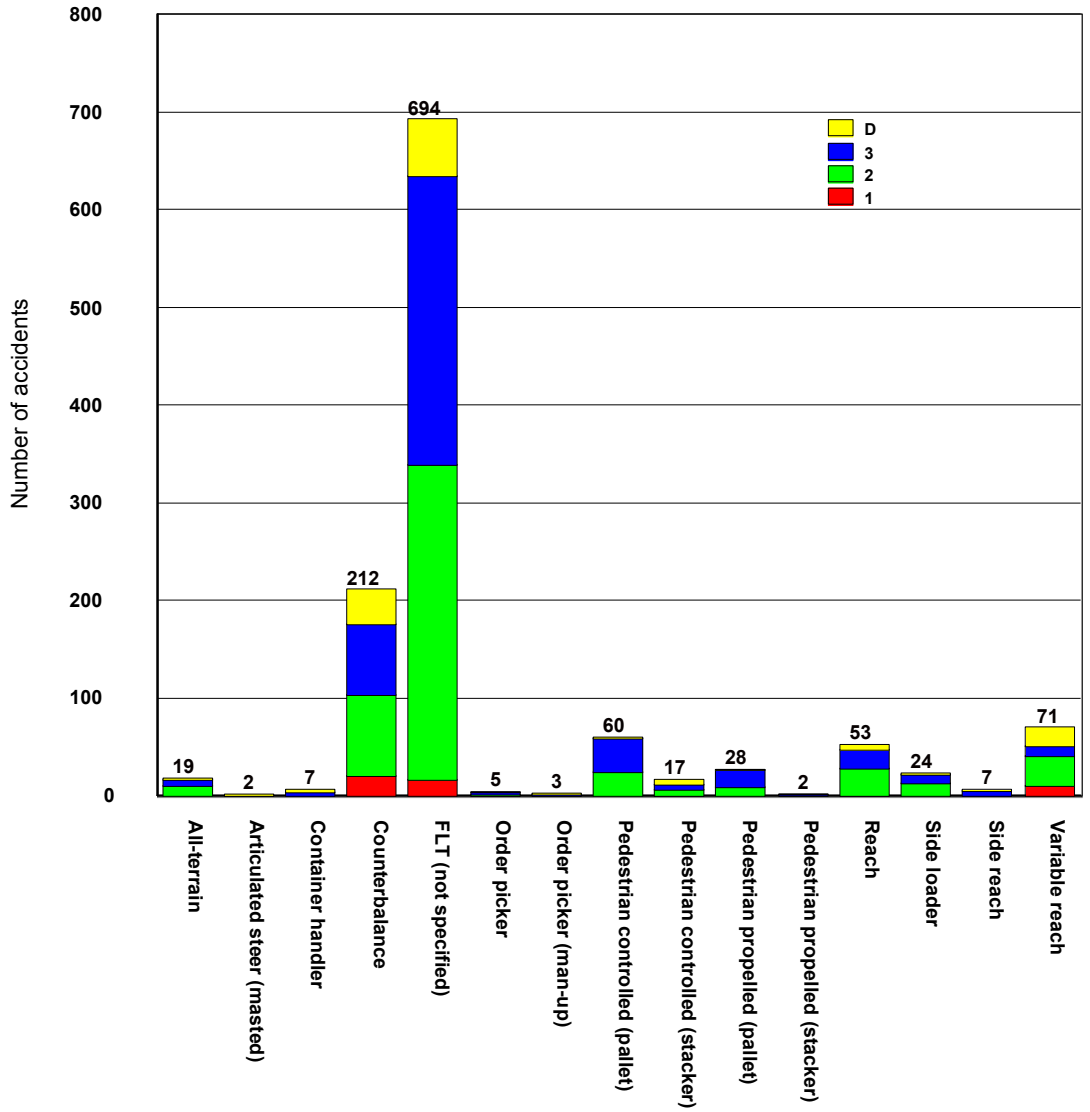
b) **Percentage of accidents/ incidents by each nature of accident**

Fatal	Major	Over 3 day	DO	Totals
	50	25	25	100
	48	45	7	100
	32	68		100
	60		40	100
2	25	71	2	100
	42	58		100
			100	100
		100		100
	43	50	7	100
6	81	13		100
	29	64	7	100
8	33	33	26	100
2	11	18	69	100
	38	26	38	100
		83	17	100
8	13	24	55	100
	20	8	72	100
12	25	18	35	100
	100			100
5	50	40	5	100
	100			100
	20	60	20	100
3	49	48	<1	100
10	52	35	3	100
10	58	32		100

c) **Percentage of accidents/ incidents by each severity of injury**

Fatal	Major	Over 3 day	DO	Totals
	0.4	0.2	0.8	0.3
	5.3	5.4	3.0	4.8
	1.7	3.9		2.3
	0.6		1.5	0.4
1.9	2.1	6.6	0.8	3.7
	0.9	1.4		1.0
			1.5	0.2
		1.4		0.6
	1.1	1.4	0.8	1.2
5.7	8.3	1.4		4.5
	0.8	1.9	0.8	1.2
1.9	0.8	0.8	2.2	1.0
1.9	0.9	1.7	23.0	3.7
	0.6	0.4	2.2	0.7
		1.0	0.8	0.5
5.7	0.9	1.9	15.6	3.2
	0.9	0.4	13.3	2.1
24.5	5.3	4.1	28.9	9.1
	0.2		0.8	0.1
3.8	3.8	3.3	1.5	3.3
	0.4			0.2
	0.2	0.6	0.8	0.4
28.3	48.3	51.9	0.8	43.5
17.0	9.0	6.6	2.2	7.6
9.4	5.6	3.5		4.3
100	100	100	100	100

Annex 5 Number of accident/incidents by truck type



Key 1 = Fatal injury 2 = Major injury 3 = Over 3 day injury D = Dangerous occurrence (DO)

	All-terrain	Articulated steer (masted)	Container handler	Counterbalance	FLT (not specified)	Order picker (not specified)	Order picker (man-up)	Pedestrian con-trolled (pallet)	Pedestrian con-trolled (stacker)	Pedestrian propelled (pallet)	Pedestrian propelled (stacker)	Reach	Side loader	Side reach	Variable reach	Total
Fatal	1			21	17	1						1	1		11	53
Major	10			83	322	1	1	25	7	10		28	13	1	31	532
Over 3 day	6	1	4	73	296	2	1	34	5	18	2	19	8	5	10	484
Dangerous oc-currence (DO)	2	1	3	35	59	1	1	1	5			5	2	1	19	135
Totals	19	2	7	212	694	5	3	60	17	28	2	53	24	7	71	1204

Annex 6 Percentage of accidents/incidents by each truck type

a) As percentage of total number of accidents/incidents investigated

	All-terrain	Articulated steer (masted)	Container handler	Counterbalance	Order picker (not specified)	Order picker (man-up)	Pedestrian controlled (pallet)	Pedestrian controlled (stacker)	Pedestrian propelled (pallet)	Pedestrian propelled (stacker)	Reach	Side loader	Side reach	Variable reach	Total
Totals	1.6	0.2	0.6	75.2	0.5	0.3	5.0	1.4	2.3	0.2	4.4	2.0	0.6	5.9	100

b) Percentage by severity of injury

	All-terrain	Articulated steer (masted)	Container handler	Counterbalance	Order picker (not specified)	Order picker (man-up)	Pedestrian controlled (pallet)	Pedestrian controlled (stacker)	Pedestrian propelled (pallet)	Pedestrian propelled (stacker)	Reach	Side loader	Side reach	Variable reach	Total
Fatal	1.9			71.6	1.9						1.9	1.9		20.8	100
Major	1.9			76.1	0.2	0.2	4.7	1.3	1.9		5.3	2.4	0.2	5.8	100
Over 3 day	1.2	0.2	0.8	76.3	0.4	0.2	7.0	1.0	3.7	0.4	3.9	1.7	1.0	2.1	100
DO+	1.5	0.7	2.2	69.6	0.7	0.7	0.7	3.7			3.7	1.5	0.7	14.1	100

c) Percentage by severity of injury for each truck type

	All-terrain	Articulated steer (masted)	Container handler	Counterbalance	Order picker (not specified)	Order picker (man-up)	Pedestrian controlled (pallet)	Pedestrian controlled (stacker)	Pedestrian propelled (pallet)	Pedestrian propelled (stacker)	Reach	Side loader	Side reach	Variable reach
Fatal	5			4	20*						2	4		15
Major	53			45	20*	33*	42	42	36		53	54	14*	44
Over 3 day	32	50*	57	41	40*	33*	57	29	64	100	36	33	71*	14
DO+	10	50*	43	10	20*	33*	1	29			9	8	14*	27
Totals	100	100	100	100	100	100	100	100	100	100	100	100	100	100

*** denotes number of accidents/incidents too small to provide reliable data**
+ DO denotes dangerous occurrence

Annex 7 Nature of accidents to different people

Nature of accident		Person injured									
		Pedestrian/ operative		Driver/operator		Lorry/visiting driver		Passenger		Maintenance personnel	
		Number	% total	Number	% total	Number	% total	Number	% total	Number	% total
Collision	Door lintel	1	0.2	2	0.6						
	Fixed object			54	15.0						
	Moving truck	1	0.2	27	7.5						
	Overhead object			3	0.8						
	Object hit person	41	6.6	3	0.8						
	Stationary vehicle	1	0.2	11	3.1						
Contact (o/h electricity)											
Ergonomic				7	1.9						
Explosion		6	1.0	4	1.1					3	21.4
Fall from height		50	8.1	1	0.3						
Harmful release		5	0.8	9	2.5						
Loss of control				9	2.5						
Mechanical failure		4	0.6	9	2.5	1	2.0				
Mechanical fault		2	0.3	3	0.8						
Other				5	1.4						
Overturn	Not specified			16	4.5						
	Forward	2	0.3	4	1.1	1	2.0				
	Lateral	4	0.6	66	18.4						
	Rearward			1	0.3						
Slip/trip/fall		10	1.6	24	6.7	1	2.0	3	14.3		
Steering wheel kickback				2	0.6						
Struck-by	Carriage/fork	3	0.5	1	0.3						
	Moving truck	400	64.7	65	18.1	38	77.6	14	66.7	5	35.7
	Falling load	63	10.2	13	3.6	8	16.3	1	5.0	2	14.3
Trapping/shearing/crushing		25	4.0	20	5.6			3	14.3	4	28.6
Totals		618	100	359	100	49	100	21	100	14	100

Annex 8 Fatal accidents for each truck type by nature of accident

Nature of accident		All-terrain	Articu-lated steer (masted)	Cont-ainer handler	Counter -balance	Order picker		Pedestrian controlled		Pedestrian propelled		Reach	Side - loader	Side reach	Variable reach	Total
						Not speci fied	Man -up	Pallet	Stacker	Pallet	Stacker					
Collision	Door lintel															
	Fixed object															
	Moving truck															
	Overhead object															
	Object hit person				1											**1**
	Stationary vehicle															
	Overhead electric															
Ergonomic																
Explosion																
Fall from height					2										1	**3**
Harmful release																
Loss of control															1	**1**
Mechanical	Failure					1										**1**
	Fault															
Other																
Overturn	Not specified				3											**3**
	Forward															
	Lateral				11										2	**13**
	Rearward															
Slip/trip/fall		1			1											**2**
Steering wheel kickback																
Struck by	Carriage/fork															
	Falling load				7							1			1	**9**
	Moving truck				8								1		6	**15**
Trapping/shearing/crushing					5											**5**
Total		**1**			**38**	**1**						**1**	**1**		**11**	**53**

Annex 9 Fatal, major & over 3 day accidents for each truck type by nature of accident

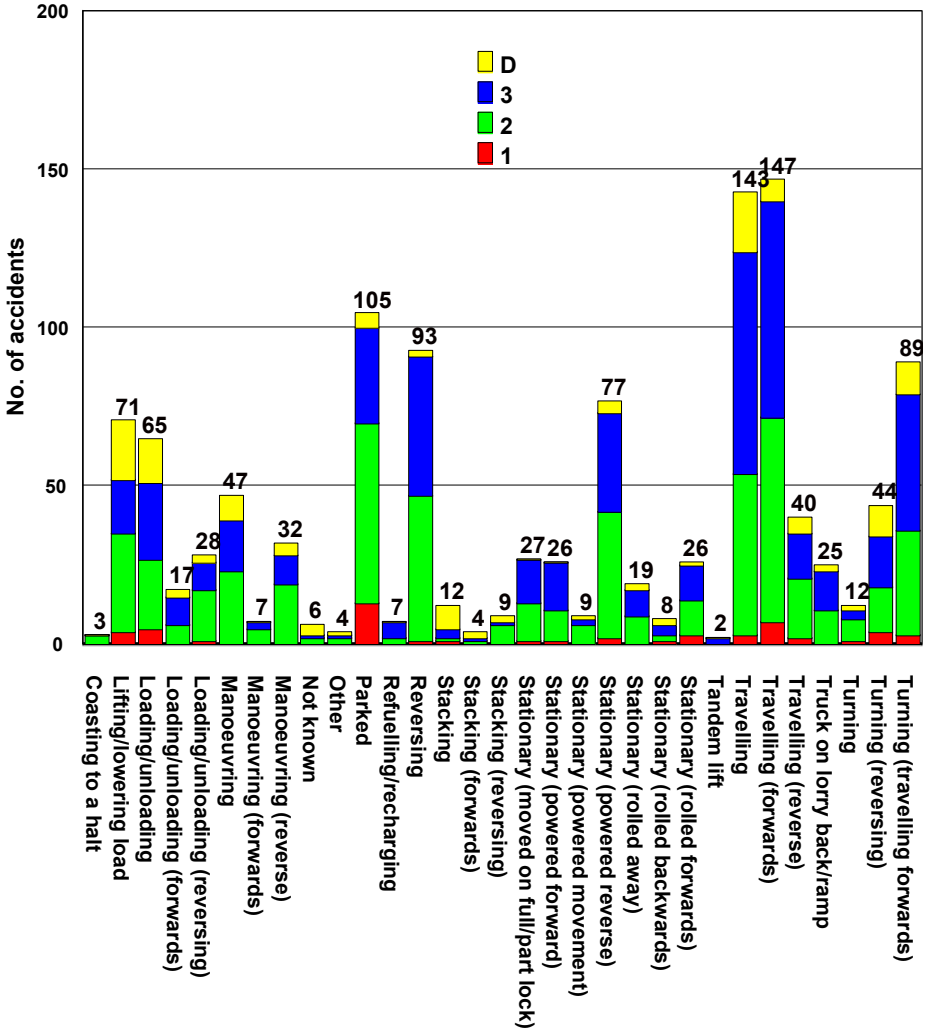
Nature of accident		All-terrain	Articu-lated steer (masted)	Cont-ainer handler	Counter-balance	Order picker		Pedestrian controlled		Pedestrian propelled		Reach	Side - loader	Side reach	Variable reach	Total
						Not specified	Man-up	Pallet	Stacker	Pallet	Stacker					
Collision	Door lintel				1							2				**3**
	Fixed object				21			18	1	2		9	2	1		**54**
	Moving truck				14			7		2		2	3			**28**
	Overhead object				1			1					1			**3**
	Object hit person		1		37			3		3						**44**
	Stationary vehicle				8		1	1	2							**12**
	Overhead electric															
Ergonomic					2					4	1					**7**
Explosion					11	1							1			**13**
Fall from height					46		1					2			5	**54**
Harmful release					14											**14**
Loss of control					4			3				1			1	**9**
Mechanical	Failure			1	8	1					1	3				**14**
	Fault				4							1				**5**
Other					5											**5**
Overturn	Not specified	2		2	10								1		2	**17**
	Forward				3							2			2	**7**
	Lateral	3			59			1					2		5	**71**
	Rearward				1											**1**
Slip/trip/fall		1			31					2						**38**
Steering wheel kickback					2			3								**2**
Struck by	Carriage/fork	2			2											**4**
	Falling load				70			1	1	6		2	4		5	**89**
	Moving truck	9			417	2		20	3	9		20	7	5	31	**523**
Trapping/shearing/crushing				1	41			1	3			4	1		1	**52**
Total		**17**	**1**	**4**	**812**	**4**	**2**	**59**	**12**	**28**	**2**	**48**	**22**	**6**	**52**	**1069**

Annex 10 Fatal and major accidents for each truck type by nature of accident

Nature of accident		All-terrain	Articu-lated steer (masted)	Cont-ainer handler	Counter-balance	Order picker		Pedestrian controlled		Pedestrian propelled		Reach	Side - loader	Side reach	Variable reach	Total
						Not specified	Man-up	Pallet	Stacker	Pallet	Stacker					
Collision	Door lintel											2				**2**
	Fixed object				7			10	1	2		7	1			**28**
	Moving truck				4			2		1		1	1			**9**
	Overhead object				1			1					1			**3**
	Object hit person				12											**12**
	Stationary vehicle				3			1	1							**5**
	Overhead electric															
Ergonomic																
Explosion					5								1			**6**
Fall from height					39		1					2			5	**47**
Harmful release					5											**5**
Loss of control					1			2				1			1	**5**
Mechanical	Failure				3	1						2				**6**
	Fault				2							1				**3**
Other																
Overturn	Not specified	1			7											**8**
	Forward				1							2			2	**5**
	Lateral	1			43			1					2		4	**51**
	Rearward				1											**1**
Slip/trip/fall		1			19			1	1							**22**
Steering wheel kickback					2											**2**
Struck by	Carriage/fork	1														**1**
	Falling load				45			1	1	3		2	2		3	**57**
	Moving truck	7			215	1		5	1	4		6	6	1	26	**272**
Trapping/shearing/crushing					28			1	2			3			1	**35**
Total		**11**			**443**	**2**	**1**	**25**	**7**	**10**		**29**	**14**	**1**	**42**	**585**

Annex 11 Number of accidents/incidents by nature of operation (all trucks)

Key 1 = Fatal injury 2 = Major injury 3 = Over 3 day injury 4 = Dangerous occurrence (DO)



		Fatal	Major	Over 3 day	DO	Totals
Coasting to a halt			3			3
Lifting/lowering load		4	31	17	19	71
Loading/ unloading	Not specified	5	22	24	14	65
	Forwards		6	9	2	17
	Reversing	1	16	9	2	28
Manoeu-vring	Not specified		23	16	8	47
	Forwards		5	2		7
	Reverse		19	9	4	32
Not known			2	1	3	6
Other			2	1	1	4
Parked		13	57	30	5	105
Refuelling/recharging			2	5		7
Reversing		1	46	44	2	93
Stacking	Not specified	1	1	3	7	12
	Forwards		1	1	2	4
	Reversing		6	1	2	9
Stationary (powered)	Not specified		6	2	1	9
	Forward	1	10	15		26
	Reverse	2	40	31	4	77
	Moved on full/part lock	1	12	14		27
Stationary (non-powered)	Rolled away		9	8	2	19
	Rolled forwards	3	11	11	1	26
	Rolled backwards	1	2	3	2	8
Tandem lift				2		2
Travelling	Not specified	3	51	70	19	143
	Forwards	7	65	68	7	147
	Reverse	2	19	14	5	40
Truck on lorry back/ramp			11	12	2	25
Turning	Not specified	1	7	3	1	12
	Travelling forwards	3	33	43	10	89
	Reversing	4	14	16	10	44
otals		53	532	484	135	1204

Annex 12 Percentage of accidents/incidents by nature of operation

a) **Percentage of total number of accidents/incidents investigated**

		Fatal	Major	Over 3 day	DO	Totals	
Coasting to a halt			0.2			0.2	
Lifting/lowering load		0.3	2.6	1.4	1.6	5.6	
Loading/ Unloading	Not specified	0.3	1.8	2.0	1.2	0.5	4.2
	Forwards		0.5	0.7	0.2	1.4	
	Reversing	0.1	1.3	0.7	0.2	2.3	
Manoeu-vring	Not specified		1.9	1.3	0.3	2.2	5.5
	Forwards		0.4	0.2		0.6	
	Reverse		1.6	0.7	0.3	2.7	
Not known			0.2	0.1	0.2	0.4	
Other			0.2	0.1	0.1	0.3	
Parked		1.1	4.7	2.5	0.4	8.7	
Refuelling/recharging			0.2	0.4		0.6	
Reversing		0.1	3.8	3.7	0.2	7.7	
Stacking	Not specified	0.1	0.1	0.2	0.6	1.0	2.1
	Forwards		0.1	0.1	0.2	0.3	
	Reversing		0.5	0.1	0.2	0.8	
Stationary (powered)	Not specified		0.5	0.2	0.1	0.7	11.5
	Forward	0.1	0.8	1.2		2.2	
	Reverse	0.2	3.3	2.6	0.3	6.4	
	Moved on full/part lock	0.1	1.0	1.2		2.2	
Stationary (non-powered)	Rolled away		0.7	0.7	0.2	1.6	4.5
	Rolled forwards	0.2	0.9	0.9	0.1	2.2	
	Rolled backwards	0.1	0.2	0.2	0.2	0.7	
Tandem lift				0.2		0.2	
Travelling	Not specified	0.2	4.2	5.8	1.6	11.9	17.4
	Forwards	0.6	5.4	5.6	0.6	12.2	
	Reverse	0.2	1.5	1.2	0.4	3.3	
Truck on lorry back/ramp			0.9	1.0	0.2	2.1	
Turning	Not specified	0.1	0.6	0.2	0.1	1.0	12.1
	Travelling forwards	0.2	2.7	3.6	0.8	7.4	
	Reversing	0.3	1.2	1.3	0.8	3.7	
Totals		4.4	44.2	40.2	11.2	100.0	

b) **Percentage of accidents/incidents for each nature of operation**

		Fatal	Major	Over 3 day	DO	Total
Coasting to a halt			100			100
Lifting/lowering load		6	44	24	26	100
Loading/ unloading	Not specified	8	34	37	22	100
	Forwards		35	53	12	100
	Reversing	4	57	32	7	100
Manoeu-vring	Not specified		49	34	17	100
	Forwards		71	29		100
	Reverse		59	28	13	100
Not known			33	17	50	100
Other			50	25	25	100
Parked		12	54	29	5	100
Refuelling/recharging			29	71		100
Reversing		1	49	48	2	100
Stacking	Not specified	8	8	26	58	100
	Forwards		25	25	50	100
	Reversing		67	22	11	100
Stationary (powered)	Not specified		67	11	22	100
	Forward	4	38	58		100
	Reverse	3	52	40	5	100
	Moved on full/part lock	4	44	52		100
Stationary (non-powered)	Rolled away		47	42	11	100
	Rolled forwards	12	42	42	4	100
	Rolled backwards	12	25	38	25	100
Tandem lift				100		100
Travelling	Not specified	2	36	49	13	100
	Forwards	5	44	46	5	100
	Reverse	5	48	35	12	100
Truck on lorry back/ramp			44	48	8	100
Turning	Not specified	8	58	26	8	100
	Travelling forwards	4	37	48	11	100
	Reversing	9	32	36	23	100

Annex 13 Fatal accidents for each truck type by nature of operation

Nature of accident		All-terrain	Articu-lated steer (masted)	Cont-ainer handler	Counter -balance	Order picker		Pedestrian controlled		Pedestrian propelled		Reach	Side - loader	Side reach	Vari-able reach	Total
						Not specified	Man -up	Pallet	Stacker	Pallet	Stacker					
Coasting to a halt																
Lifting/lowering load					3	1										**4**
Loading/ unloading	Not specified				5											**5**
	Forwards															
	Reversing				1											**1**
Manoeuvring	Not specified															
	Forwards															
	Reversing															
Not known																
Other																
Parked		1			9										3	**13**
Refuelling/recharging																
Reversing					1											**1**
Stacking	Not specified				1											**1**
	Forwards															
	Reversing															
Stationary (powered movement)	Full/part lock				1											**1**
	Forward				1											**1**
	Not specified															
	Reverse														2	**2**
Stationary (non-powered move-ment)	Rolled away															
	Rolled backwards														1	**1**
	Rolled forwards				2										1	**3**
Tandem lift																
Travelling	Not specified				1							1			1	**3**
	Forwards				5										2	**7**
	Reverse				1								1			**2**
Truck on lorry back/ramp																
Turning	Not specified				1											**1**
	Reversing				3										1	**4**
	Forwards				3											**3**
Total		**1**			**38**	**1**						**1**	**1**		**11**	**53**

Annex 14 Fatal, major & over 3 day accidents for each truck type by nature of operation

Nature of accident		All-terrain	Articu-lated steer (masted)	Cont-ainer handler	Counter-balance	Order picker		Pedestrian controlled		Pedestrian propelled		Reach	Side-loader	Side reach	Vari-able reach	Total
						Not specified	Man-up	Pallet	Stacker	Pallet	Stacker					
Coasting to a halt								2				1				**3**
Lifting/lowering load		1		1	37	1			2	1		8			1	**52**
Loading/ unloading	Not specified				41				1	2		1	3		3	**51**
	Forwards				13			1							1	**15**
	Reversing				26											**26**
Manoeuvring	Not specified			1	22			6	2	4	1		1		2	**39**
	Forwards				7											**7**
	Reversing	2			17			2	2	1			1		3	**28**
Not known					2										1	**3**
Other					2								1			**3**
Parked		2			85		1		1			2	2		7	**100**
Refuelling/recharging					6	1										**7**
Reversing		1			69	1		9	2	2		3		2	2	**91**
Stacking	Not specified			1	4											**5**
	Forwards				2											**2**
	Reversing				7											**7**
Stationary (powered movement)	Full/part lock	1			26											**27**
	Forward				20			2				3			1	**26**
	Not specified				6			2								**8**
	Reverse				53			2		2		5			9	**73**
Stationary (non-powered move-ment)	Rolled away	1			13							1			2	**17**
	Rolled backwards				5										1	**6**
	Rolled forwards				22								1		2	**25**
Tandem lift					2											**2**
Travelling	Not specified	2			79			22	1	8		3	5	1	3	**124**
	Forwards	2	1		115			3		1		7	3		8	**140**
	Reverse	1			21	1	1	2		2		2	2		3	**35**
Truck on lorry back/ramp					18			2		1	1		1			**23**
Turning	Not specified			1	10											**11**
	Reversing				25			1				4	1		3	**34**
	Forwards	4			57			3	1	2		8	1	3		**79**
Total		**17**	**1**	**4**	**812**	**4**	**2**	**59**	**12**	**28**	**2**	**48**	**22**	**6**	**52**	**1069**

Annex 15 Fatal and major accidents for each truck type by nature of operation

Nature of accident		All-terrain	Articu-lated steer (masted)	Cont-ainer handler	Counter-balance	Order picker		Pedestrian controlled		Pedestrian propelled		Reach	Side-loader	Side reach	Variable reach	Total
						Not specified	Man-up	Pallet	Stacker	Pallet	Stacker					
Coasting to a halt								2				1				3
Lifting/lowering load		1			25	1			2			6				35
Loading/ unloading	Not specified				20				1			1	2		3	27
	Forwards				5										1	6
	Reversing				17											17
Manoeuvring	Not specified				15			4	1	1					2	23
	Forwards				5											5
	Reversing	1			11			1	1	1			1		3	19
Not known					2											2
Other					1											2
Parked		1			58		1		1			2			7	70
Refuelling/recharging					2											2
Reversing					34			6	1	1		2		1	2	47
Stacking	Not specified				2											2
	Forwards				1											1
	Reversing				6											6
Stationary (powered movement)	Full/part lock	1			12											13
	Forward				8			1				1			1	11
	Not specified				5			1								6
	Reverse				31					2		2			7	42
Stationary (non-powered move-ment)	Rolled away				8										1	9
	Rolled backwards				2										1	3
	Rolled forwards				11								1		2	14
Tandem lift																0
Travelling	Not specified	2			36			6		1		3	4		2	54
	Forwards	1			56			2		1		4	2		6	72
	Reverse	1			13	1		1		1		1	1		2	21
Truck on lorry back/ramp					10								1			11
Turning	Not specified				8											8
	Reversing				11			1				3	1		2	18
	Forwards	3			28					2		3				36
Total		11			443	2	1	25	7	10		29	14	1	42	585

Annex 16 Numbers of Overturning Accident/incidents For Each Truck Type and the Consequences

a) Numbers of accidents/incidents

Truck type	Nature of overturn	Severity of accident/incident				Totals
		Fatal	Major	Over 3 day	Dangerous occur-rence	
All terrain	Lateral		2	3	1	6
Container handler	Lateral			2	2	4
Counterbalance	Lateral	14	36	19	34	103
	Forward		1	2	15	18
	Rearward		1			1
Pedestrian controlled (pal-let or stacker)	Lateral		1	1	4	6
	Forward				1	1
Reach	Forward		2		2	4
Side loader	Lateral		2	1		3
Side reach					1	1
Variable reach	Lateral	2	2	3	18	25
	Forward		2			2
Totals		16	49	31	78	174

b) Percentage of overall numbers of accidents/incidents

Truck type	Nature of overturn	Severity of accident/incident				Totals
		Fatal	Major	Over 3 day	Dangerous occur-rence	
All terrain	Lateral		1	2	1	4
Container handler	Lateral			1	1	2
Counterbalance	Lateral	8	21	11	20	59
	Forward		1	1	9	11
	Rearward					
Pedestrian controlled (pallet or stacker)	Lateral		1	1	2	4
	Forward				1	1
Reach	Forward		1		1	2
Side loader	Lateral		1	1		2
Side reach						
Variable reach	Lateral	1	1	2	10	14
	Forward		1			1
Totals		9	28	18	45	100

c) Percentage of accidents/incidents by severity for each truck and each type of overturn

Truck type	Nature of overturn	Severity of accident/incident				Totals
		Fatal	Major	Over 3 day	Dangerous occur-rence	
All terrain	Lateral		33	50	17	100
Container handler	Lateral			50	50	100
Counterbalance	Lateral	14	35	18	33	100
	Forward		9	9	82	100
	Rearward		100			100
Pedestrian controlled (pallet or stacker)	Lateral		25	25	50	100
	Forward				100	100
Reach	Forward		50		50	100
Side loader	Lateral		67	33		100
Side reach					100	100
Variable reach	Lateral	8	8	12	72	100
	Forward		100			100
Totals		9	28	18	45	100

Annex 17 Counterbalance trucks : Struck-by (moving truck)

a) Numbers of accidents/incidents

Nature of operation		Fatal		Major		Over 3 day		Totals	
		No	Total	No	Total	No	Total	No	Total
Loading/ unloading	Not specified	1	2	5	22	8	23	**14**	**47**
	Forwards			4		6		**10**	
	Reversing	1		13		9		**23**	
Manoeuvring	Not specified			8	21	3	11	**11**	**32**
	Forwards			2		2		**4**	
	Reverse			11		6		**17**	
Reversing				27	27	25	25	**52**	**52**
Stacking	Reversing			2	2			**2**	**2**
Stationary (powered movement)	Not specified		2	5	47		43	**5**	**92**
	Forward	1		5		9		**15**	
	Reverse			27		21		**48**	
	Full/part lock	1		10		13		**24**	
Stationary (non-powered movement)	Not specified		2	8	17	5	19	**13**	**38**
	Rolled forwards	2				3		**3**	
	Rolled backwards			9		11		**22**	
Travelling	Not specified		1	14	51	15	59	**29**	**111**
	Forwards	1		31		38		**70**	
	Reverse			6		6		**12**	
Truck on lorry back/ramp				3	3	1	1	**4**	**4**
Turning	Not specified		1	2	17		21	**2**	**49**
	Forwards			4		6		**11**	
	Reversing	1		11		15		**26**	
Totals		8		207		202		**417**	

b) Percentage by nature of operation

Nature of operation		Fatal		Major		Over 3 day		Totals	
		No	Total	No	Total	No	Total	No	Total
Loading/ unloading	Not specified	13	25	2	11	4	11	**3**	**11**
	Forwards			2		3		**2**	
	Reversing	13		6		4		**6**	
Manoeuvring	Not specified			4	10	1	5	**3**	**8**
	Forwards			1		1		**1**	
	Reverse			5		3		**4**	
Reversing				13	13	12	12	**12**	**12**
Stacking	Reversing			1	1			**1**	**1**
Stationary (powered movement)	Not specified		25	2	23		21	**1**	**22**
	Forward	13		2		4		**4**	
	Reverse			13		10		**12**	
	Full/part lock	13		5		6		**6**	
Stationary (non-powered movement)	Not specified		25	4	8	2	9	**3**	**9**
	Rolled forwards	25				1		**1**	
	Rolled backwards			4		5		**5**	
Travelling	Not specified		13	7	25	7	29	**7**	**27**
	Forwards	13		15		19		**17**	
	Reverse			3		3		**3**	
Truck on lorry back/ramp				1	1	1	1	**1**	**1**
Turning	Not specified		13	1	8		10	**<1**	**9**
	Forwards			2		3		**3**	
	Reversing	13		5		7		**6**	
Totals		100		100		100		**100**	

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