

**ROOFS**  
A Study of Fatal  
Accidents at Work

# CONTENTS

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## PREFACE

## FOREWORD

## AN ANALYSIS OF ROOF MAINTENANCE

Introduction  
Maintenance Activities  
People  
Type of Accident  
Accident Cause  
Precautions  
Conclusions

CASE STUDY: WORK ON FRAGILE ROOFS	11
ACCIDENT OUTLINES	13
APPENDIX 1: BIBLIOGRAPHY	16

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# PREFACE

This short report about the dangers to which people are exposed while engaged in maintenance\* work on roofs forms part of a wider study carried out by the Accident Prevention Advisory Unit (APAU) of the Health and Safety Executive (HSE). It is based on information contained in reports of fatal accidents which occurred in 1980, 1981 and 1982. The reports were prepared by Agricultural Inspectors, Factory Inspectors and Mines and Quarries Inspectors.

The objective of this report is to make available to a wider audience the lessons learned first-hand by some people at the cost of the life of a colleague or friend. It is hoped in doing so that the dangers are fully appreciated, the causes of accidents are understood, and the use of safe systems of work is promoted.

\* The definition of 'maintenance' used for the purposes of the study was 'the repair, restoration or cleaning of process machinery, plant, vehicles, buildings, structures and roads'.

† 'Deadly Maintenance' a report prepared by the Accident Prevention Advisory Unit of the Health & Safety Executive and available from HMSO

'Deadly Maintenance - Plant/Machinery', a report prepared by the Accident Prevention Advisory Unit of the Health & Safety Executive and available from HMSO

# FOREWORD

Most people will recognise the essential nature of maintenance work, but perhaps few will fully appreciate its potential to kill or seriously injure workpeople.

The title 'Deadly Maintenance' may appear emotive, but it is merely a true reflection of the facts; over one hundred people killed a year.

This publication is an attempt to draw attention to what actually happens, and to offer some ideas on prevention.

There can be few people or industries who will not at sometime be affected by maintenance activities. I commend this report to them in the hope that it will foster not only a clear understanding, but also a new commitment to tackle this appalling record.

A handwritten signature in black ink, reading "John R. King". The signature is written in a cursive, flowing style with a period at the end.

J D Rimington Director General HSE

# AN ANALYSIS OF ROOF MAINTENANCE

## Introduction

1 Roof maintenance ranges from cleaning and minor repairs to full recovering operations. Its very nature involves work on structures at high levels. Dangers are associated not only with a wide variety of working places but also the means of access to them. The principal hazard is falls from flat or sloping roofs, through fragile roof materials, from ladders and scaffolds. Even the pre-work inspection holds the same risks to life.

2 Individuals or small groups work at scattered sites often near to others such as contractors, occupants of premises or

members of the public. On occasions poor weather conditions can have an adverse effect on events. Each of these aspects introduce additional difficulties which need to be properly controlled if the safety of the maintenance personnel is to be ensured. The *evidence to date is not encouraging.*

3 In the three year period of this study, 63 deaths occurred during roof maintenance work, which is equivalent to 19% of the total number of maintenance fatal accidents. Most could have been prevented by the use of a few elementary precautions.

## Maintenance Activities

4 An analysis of the type of accident and its relationship to roof maintenance activities is presented in Table A.

### Repair

5 In just over half the cases, the victims were engaged in repair work. The replacement of tiles and roof sheets, the renewal of flashing and the application of weather proof coatings were typical jobs.

'A self-employed slater slid off the edge of a sloping roof 3m (10 ft) to the ground below. He was repairing a roof using the bottom half of a metal extension ladder fixed with a make-shift metal ridge hook. The hook pivoted out of position and allowed the ladder and the deceased to slide off the roof.'

### Renovation

6 The complete replacement of the roof covering was the next most significant type of work accounting for 38% of the total. A variety of roofing materials including tiles, slates, asbestos cement sheets and corrugated plastic sheets were involved. Five lives were lost during the re-surfacing of flat felt-covered roofs.

'The working director of a roofing company fell 10.7m (35 ft) while stripping and re-sheeting the asbestos cement roof of a factory. A single timber staging slipped and the director lost his balance. There was an adequate number of stagings available but they had been left at ground level.'

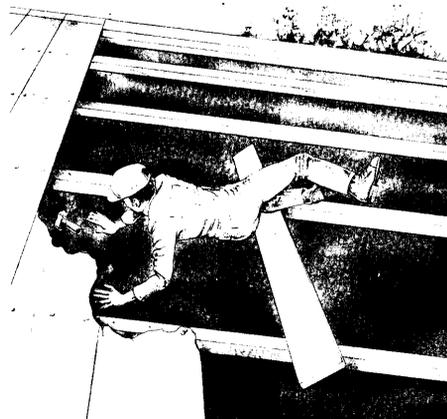
'A student working during the vacation fell 12.2m (40 ft) through an asbestos cement sheet roof of a warehouse. The roof was being inspected before work commenced but it was usual for the experienced employees to walk on the roof bolts. No crawling boards had been taken onto the roof.'

### Cleaning

7 Roof cleaning was responsible for the remaining 11. The sweeping of debris from flat or sloping roofs, the removal of accumulated materials from valley gutters and the washing of Georgian wired glass rooflights all featured



Man cleaning valley gutters on asbestos cement sheet roof. Broom, spade and bucket in evidence. Stumbles and falls through roof sheets.



Stripping asbestos cement sheet roof of a factory. Man falls from a single narrow (1 1/2") roof board through a roof sheet.

'An apprentice plumber fell 9.1 m (30 ft) through an asbestos cement sheet roof of a warehouse while cleaning the valley gutters. His mate who fell with him was seriously injured. The work area along the edge of the gutter was not covered. There was a total lack of planning before the job was started.'

### People

8 Fifty-one percent of those killed were roof workers, such as slaters, tilers and sheeters. The following occupations also appeared: jobbing builders; factory building

maintenance staff; carpenters; labourers; plumbers and general farmworkers, Two students died while employed on a casual basis during their holidays.

9 It is of particular concern to find that a significant proportion came from the ranks of management. Fourteen per cent were described as manager, supervisor or proprietor. Some of these were farmers. This can only raise doubts about the safety of persons who worked in their care.

### Type of Accident

10 Table A illustrates the not surprising fact

that 97% of deaths occurred due to falls of persons from roofs, working platforms, or means of access to the roof.

### Fragile Materials

11 Thirty deaths were attributable to falls through fragile roof materials such as asbestos cement sheets, translucent plastic sheets or glass during repair, renovation or cleaning. The most common cause was simply walking or standing on these fragile materials. It is of interest that almost as many people fell through adjacent fragile roof sheets from valley gutters and from catwalks or roof ladders.

TABLE A: SHOWING THE RELATIONSHIP BETWEEN ACCIDENT TYPE AND ROOF MAINTENANCE ACTIVITY

ACCIDENT TYPE	ACTIVITY												Totals
	Felt Roofs			Slate/Tile Roofs		Asbestos Cement or Translucent Sheet Roofs			Glazed Roofs		Metal Clad Roofs		
	Repair	Recover	Cleaning	Repair	Recover	Repair	Recover	Cleaning	Repair	Cleaning	Recover	Cleaning	
FALLS THROUGH FRAGILE ROOF MATERIALS	2	—	—	—	—	10	8	3	3	1	1	2	30
FALLS FROM SLOPING ROOFS				7	3	2							12
FALLS FROM FLAT ROOFS	1	3	1	—	—								5
FALLS FROM LADDERS		2	—	2	2								6
FALLS FROM SCAFFOLDS	—	1	—	—	2	—	—	—					3
FALLS FROM OTHER MEANS OF ACCESS	—	—	—	3	—	—	1	—	—	—	—	—	4
FALLS FROM WORK PLATFORMS	—	—	—	—	—	1	—	—	—	—	—	—	1
ELECTROCUTION	—	—	—	—	1	—	—	—	—	—	—	—	1
BURNS	1	—	—	—	—	—	—	—	—	—	—	—	1
SUB TOTALS	4	6	1	12	8	13	9	3	3	1	1	2	63
TOTALS		11		20		25			4		3		

12 A wide spread failure to provide safeguards against the primary hazard was clearly evident. The complete absence or inadequacy of roof ladders, boards, catwalks or staging to provide safe means of access along valley gutters, across roof ridges and around working areas was frequently noted. In some cases insufficient equipment was available to allow the staging to be safely moved from one work position to another.

13 The inexperience of personnel combined with a failure to provide instruction, training and adequate supervision was associated with a number of these accidents. The bad habit of walking the roof bolts, in reality akin to walking a tightrope, was ever present.

#### Sloping Roofs

14 Twelve people fell from sloping roofs. Slate and tile roofs were the main culprits. Four accidents were related to defective roof ladders. The ridge hooks either parted from the ladders or were not of adequate proportions to hold securely over the roof ridge. The ladders and personnel simply slipped down the sloping roofs like a sledge on snow. Six occurred when persons were walking on the roof slates or tiles, sometimes in damp or icy weather conditions.

15 The absence of safe working platforms, edge protection and unsatisfactory means of access also figured prominently.

#### Flat Roofs

16 Five people fell to their deaths from the edges of flat roofs. In two of these incidents materials were being raised or lowered using powered hoists when the hoist frame collapsed dragging personnel over the roof edge. Hoist counterweights were not properly installed in either case. In three others, workmen fell from the unprotected roof edges while inspecting the partly completed re-felting work, cleaning off debris, or when transferring from an access ladder which was too short to the roof while carrying materials. The absence of roof edge protection was a common factor.

#### Ladder

17 There were six falls from access ladders, mainly when they slipped sideways or away from the building. These illustrate the



Man carrying a roll of roof felt on his shoulder up a ladder to roof level. Loses control of roll, man and materials fall to ground.

TABLE B: SHOWING THE MAJOR CAUSE OF ACCIDENTS DURING THE MAINTENANCE OF ROOFS

Major cause of accident	Number of Fatalities
Absence or failure in system of work	26
Absent or unsafe equipment, working platform or machinery	16
Unsafe means of access or workplace	8
Unauthorised activity	4
Human error	4
Unknown	3
Inadequate management organisation or supervision	2
TOTAL	63

N.B. MAJOR CAUSE —

The single most important factor in the chain of events leading to each fatal accident

dangers not only of not securing ladders but also of trying to carry cumbersome materials on those that are secured.

#### Scaffolds

18 The inadequate construction of scaffolds and the lack of access ladders accounted for three further falls.

#### Miscellaneous

19 Four workmen fell from unsafe means of access and one other from a tractor-mounted excavator bucket being used as a working platform.

20 A roofworker was electrocuted when using a 240 volt portable electric tool. He touched alive wire exposed when a taped joint parted.

21 A carpenter fell to his death through an unprotected glass skylight on a flat roof while carrying a container full of hot bitumen. He was covered by the hot tar and the building was seriously damaged by fire.

#### Accident Cause

22 Most accidents involve a number of causative factors. However, one factor in any accident is often found to play a major role. An analysis of major causes was made and the results are presented in Table B. The definition of major cause used for this analysis was "the single most important factor in the chain of events leading to each fatal accident".

23 Inadequate safety equipment or the complete lack of any safety equipment at all was clearly shown to be the major cause in just over a quarter of the cases. Roof ladders and edge protection were mentioned in most cases. Unsafe means of access accounted for 130%, mainly ladders or walkways which were not properly secured. Failure to provide proper means of access with the consequential use of unorthodox means was also noted. Human error and unauthorised activity made up a further 12%.

24 *But the sheer failure of management to plan, implement and then maintain safe working procedures was identified as the major cause in 44.5% of fatal accidents involving roof maintenance.*

## Precautions

**25** It is clear that over 80% of the accidents could have been prevented. Management and workforce alike seem unable to appreciate, or choose to ignore, the obvious and ever present risk of falling during roofwork. *The consequence of a slip, stumble, or loss of balance is often a serious injury or death.* It is therefore most important that safe methods of work are planned before starting a job and stuck to right through to the finish. The following aspects as a very minimum should be considered.

### (a) Pre-Work Inspection

Some buildings are provided with permanent catwalks on the roofs. They must be kept in a sound condition and adequately secured to the structure. Temporary excursions for closer inspection should be avoided particularly on roofs made of fragile materials, unless extra equipment has been provided.

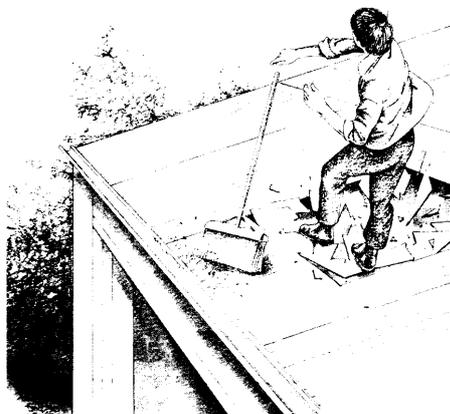
Before anyone ventures onto the roof surface, for any purpose, even to assess the extent of the repairs, the equipment necessary to ensure safety should be obtained and installed.

### (b) Management

Roof repair activities are often carried out at scattered sites beyond the immediate supervision of senior management. It is therefore important that the site supervision is of good calibre, has adequate authority and appropriate experience to progress the task safely through to completion. Senior management should make arrangements for periodic monitoring of the standards achieved on sites, and should ensure the availability of appropriate technical expertise where required. Many of these aspects will be equally applicable to factory building maintenance departments.

### (c) Safe Working Procedures

Every roof repair or renovation job should be evaluated by an experienced person not only to assess the cost, but also the hazards present and the precautions necessary to ensure the safety of the workforce, other contractors, building occupiers or members of the public. The precautions which, combined, can form a safe method of work, are often of a basic nature, and well known within the roofing industry. Occasionally,



Re-covering flat roof with new felt. Man kneeling examining partly completed work near roof edge, and falls off to the ground.

Man walking down sloping asbestos cement sheet roof sweeping debris with a broom. Farm building. Man falls through plastic skylight.

complex tasks or buildings which present unusual problems may be encountered, when specialist advice should be sought.

The safe working procedures should be relevant to the job, clearly and concisely laid down and capable of being understood by the users. Where other contractors are engaged to provide or erect specialist equipment such as static or mobile scaffolds, steps should be taken to check that the

equipment is available on site before work commences, otherwise unsafe unorthodox temporary measures may be used.

Repair operations, often of relatively short duration, accounted for 51% of the roof maintenance fatalities. It is in this area of work that safe working procedures tend to be ignored most.

(d) Information, Instruction, Training  
Roofworkers, like any other tradesmen, need to receive appropriate instruction and training in the hazards likely to be encountered, why accidents happen and how they can be prevented.

The problem, however, extends beyond the specific occupation of roofer. Forty-nine per cent of the persons killed in these accidents were not referred to as roofers. Factory process operators, plumbers, students were some of the descriptions used. There is undoubtedly plenty of scope for improving general safety awareness.

Before leaving the depot, the supervisor should be provided with information relating to the extent of the job, the type and age of the roof, the hazards likely to be encountered, the safe working procedures to be applied, the amount and type of safety equipment to be taken to the site.

### (e) Equipment

Sufficient quantities of suitable equipment should be available to ensure safe means of access to roof level and safe movement across the roofs, to prevent falls from the roof edge, to provide safe working platforms and to safeguard against falls through fragile materials.

If only the following simple rules had been followed a lot of the accidents referred to in this report could have been prevented. More detailed guidance is given in specific HSE publications. \*

*Rule 1* Ladders should be

a sufficient height above roof level to provide a secure handhold;  
tied or otherwise secured to the building or scaffold;  
of sound construction and kept in good condition:

placed on a firm, even base.

**Rule 2** Scaffolds and work platforms should be

- of adequate proportions;
- of sound construction, without gaps in the boarding;
- provided with toe-boards and edge protection;
- secured to the structure, building or other means adopted to ensure stability;
- provided with adequate access ladders

**Rule 3** Roof ladders should

- incorporate a ridge hook of adequate proportions and robust construction firmly attached to the ladder;
- be of adequate length in relation to the roof and the type of work to be done;
- sufficient in number for the type of work and number of personnel involved in the job.

**Rule 4** Roof boards should be

- available in sufficient number to provide safe access along the valley gutters on fragile roofs, and to cover the fragile roof adjacent to the work area in the gutter;
- sufficient in number and installation to provide good access to the actual work position and obviate the need to over-reach;
- sufficient in number to allow safe movement of the boards from one work location to another;
- provided to cover fragile skylights on roofs otherwise constructed of non-fragile materials.

**Rule 5** Edge Protection should be

- provided on flat or sloping roofs, scaffolds and work platforms;
- continuous along the roof edge or restricted work area;
- of adequate height and strength to prevent persons falling;
- stabilised or properly anchored to the structure.

(f) Lifting Materials to Roof Level

Suitable means should be provided for raising cumbersome or heavy materials to roof level. Control of unwieldy materials whilst climbing ladders cannot always be

achieved. Mechanical hoists should be properly erected, including securing the appropriate counterweights. The safe removal of waste materials from the roof, and the possible effect of falling materials on third parties should be considered.

(9) Extra Hazards

Adverse conditions, wet, icy or windy weather, can sometimes mean that work should be delayed or temporarily halted.

### Conclusions

**26** The hazards associated with roofwork and the means of dealing with them are generally well known in the industry. This study highlights failures to plan jobs to include safety provisions and a tendency to cut corners particularly on roof repair operations. *The consequences of falls from roofs are plain for all those who wish to see-63 deaths! Most could have been avoided.*

**27** There is plenty of scope for management, site supervision and the workforce to improve the situation.



### **Work on the roof**

No one should venture onto a fragile roof, regardless of the purpose, without the prior provision of suitable safety precautions. Crawling boards, buck-boards, cat ladders or roof ladders should be used. Enough boards should be available to allow work to proceed, and for the re-positioning of the boards as work progresses in safety. *At the very least*, two boards or ladders are required for a two-man team. The boards should be long enough to span the roof supports without leaving an unsupported end. Ladders and roof boards should be inspected regularly for damage or excessive wear. Faulty equipment should be destroyed.

- **Warning signs**

Suitable warning signs 'FRAGILE ROOF COVERING: USE CRAWLING BOARDS' should be prominently displayed on all buildings incorporating roofs partly or wholly constructed of fragile roof materials. In particular the signs should be posted near to potential means of access onto the roof.

The dangers associated with work on fragile roofs cannot be ignored. \* It is essential for a proper pre-inspection to be made, for work to be planned and for safe systems of work to be followed. A failure to do so often leads to a fatal fall.

# ACCIDENT OUTLINES

1 A self-employed tiler fell 2.5m (8ft 3in) from the edge of a lean-to roof. He was removing waste material from a section of the main roof, down a ladder onto a flat section and across a sloping roof onto a lean-to. No edge protection was provided.

2 A self-employed bricklayer fell 4.6m (15ft) from a fire escape following minor repairs to an adjoining slate roof. The handrails of the fire escape were badly corroded and failed as he climbed over them.

3 A self-employed roofing worker fell 7.6m (25ft) through 6mm (0.24 in) thick asbestos cement sheeting on a 10° pitched roof of a tyre depot. He and another worker were using half an extension ladder as a crawling board.

4 A joiner fell through a glass fibre roof light incorporated into an asbestos cement sheet roof. He gained access by a ladder but crawling boards were not available to use on the roof.

5 A plumber fell 12.8m (42ft) from a scaffold platform when a scaffold board snapped. The main contractor altered the scaffold without consulting the scaffolding sub-contractor.

6 A roofing worker fell 21.3m (70ft) from the edge of a flat roof. Equipment was being lowered from the roof using an improvised scaffold tower fitted with a gin wheel. No back weights were fitted to the tower and when the rope snagged the tower rotated. The roofer tried to free the rope, became entangled in the tower and was taken over the parapet.

7 A glazier fell 15.2m (50ft) through the sloping asbestos cement sheet roof of a factory. He was working from two lines of roofing ladders and a wood board spanning them. The horizontal working platform was narrow and the roofing ladders were badly maintained.

8 A self-employed roofing worker fell 5.8m (19ft) from a ladder. He had been contracted to carry out slating work. Access to the roof was by lashed aluminium ladders. The roofer was

climbing a ladder carrying wood battens. He tried changing his hold, the battens scissored and he lost his balance.

9 A roofing felt fixer, fell off the edge of a flat roof of a two-storey building. There was no roof edge protection.

10 A self-employed property repairer fell 3m (10ft) from an unsecured ladder which extended two-three rungs above the eaves of a roof. He had just got onto the ladder when the base slipped outwards.

11 A crane driver fell 3.6m (12ft) through the thin plastic sheeting, covering a swimming pool. The managing director of a transport company used company employees to repair the roof of his pool at his private residence. The deceased slipped from the ridge of the roof through a sheet which he had de-nailed. The pitch of the roof was 100. Crawling boards were not used.

12 A student employed as a casual worker fell 15.2m (50ft) through a glass roof of a factory which he had been cleaning from an adjoining flat roof. There was no reason for him to climb onto the sloping glass roof.

13 A self-employed slater slid off the edge of a sloping roof 3m (10ft) to the ground below. He was repairing a roof using the bottom half of a metal extension ladder fixed with a makeshift metal ridge hook. The hook pivoted out of position and allowed the ladder and the deceased to slide off the roof.

14 A roofing worker fell when a corrugated asbestos cement sheet, on the roof of a brickwork, broke under load. No crawling boards were available.

15 A roofing worker cropping bolt heads on a corrugated asbestos cement sheet roof stumbled on the cat ladder and fell through. Adequate crawling ladders were provided but the system of work was not as safe as reasonably practicable.

16 A plumber working alone in a football ground fell to his death through a single skin, single sheet, asbestos cement

roof. No crawling boards, ladders or other safety devices were available on site.

17 A partner in a firm of general builders fell 3.4m (11 ft) through the asbestos cement roof of a factory. He was carrying out minor repairs working on his own. A single plank 228mm (9in) wide was found at the approaches to the roof.

18 A self-employed roofer slipped off the edge of a slate roof of a domestic property. An extension ladder gave access to the eaves and a roof ladder was fixed over the ridge. He was found dead on the pavement.

19 A labourer fell 4.3m (16ft) from the unprotected edge of a flat roofed batching hut in a concrete mixing plant. He was doing a routine, weekly cleaning task.

20 A foreman roofing worker fell 4.9m (16ft) through a plastic roof light. No staging had been provided. There were no covers for the roof lights.

21 A joiner fell 2.1 m (7ft) through a plastic car port roof at the home of his company's managing director. He was standing on a 2.54cm (one inch) thick board when he fell.

22 A self-employed roofer slipped on an icy, shallow pitched asbestos cement sheet roof and fell 2.4m (8ft). Crawling boards or ladders were not used.

23 A roofing worker slipped and fell 4.6m (15ft) from a tied aluminium ladder. He was carrying a half roll of roofing felt.

24 A man fell 8.8m (29ft) from a crawling ladder through an aperture in a sloping asbestos cement sheet roof. He was lifting a roof sheet to fill in the aperture. This was a difficult operation where extra precautions had not been planned beforehand.

25 A self employed builder fell 6.1 m (20ft) from the edge of a pitched roof of a two-storey terraced house which was being re-tiled. He was walking along the

battens at the rear of the house. There was no roof edge protection.

26 A roofing worker fell 5.5m(18ft) through an asbestos cement sheet roof. He was removing old asbestos roof sheets and replacing them with a metal deck. Roofing boards had not been placed on the fragile area.

27 A self-employed roofer fell 12.5m (41 ft) when the securing rope broke causing a ladder to slip. He was replacing roof slates on a sloping roof. There was no roof edge protection.

28 A roofer fell from a valley gutter through the adjacent asbestos cement sheets of the transport warehouse roof. The method of work did not include boarding out the fragile roof area.

29 A building firm partner fell 9.4m (31 ft) from the coping of a parapet wall. Repair of a hospital slate roof and gutters was being carried out. The man could have used a good access scaffold.

30 A factory operative fell 6.4m (21 ft) through a fragile roof. A colleague was repairing a leaking roof. The operative, contrary to instructions, decided to join him. He fell through a translucent fibreglass sheet while walking along the valley gutter.

31 A roofing worker fell from a valley gutter through a 6mm (0.25 in) glass roof in an adjacent asbestos roof. The means of access along the valley gutter was not protected. There was only one crawling board available for the two gangs in the work area.

32 A self-employed roofer fell 2.7m (9ft) from an unsecured ladder placed against the eaves of a bungalow roof which was being re-tiled and weatherproofed.

33 A director of a small jobbing firm fell 6.1 m (20ft) from the eaves of a house when the unsecured roof and access ladders slipped.

34 A cat ladder slipped from a sloping roof taking a roofing worker with it, 9.1 m (30ft) to the ground below. The cat ladder

was fixed by an inadequate block stop positioned over the ridge.

35 A joiner fell 9.1 m (30ft) through an asbestos cement sheet roof of a dock warehouse. He was moving lightweight stagings while standing on the asbestos cement sheets. An insufficient number of stagings had been taken onto the roof.

36 An apprentice plumber fell 9.1 m (30ft) through an asbestos cement sheet roof of a warehouse while cleaning the valley gutters. His mate who fell with him was seriously injured. The work area along the edge of the gutter was not covered. There was a total lack of planning before the job was started.

37 The working director of a roofing company fell 10.7m (35ft) while stripping and re-sheeting the asbestos cement roof of a factory. A single timber staging slipped and the director lost his balance. There was an adequate number of stagings available but they had been left on the ground.

38 An experienced maintenance chargehand fell 9.8m (32ft) through a factory roof while replacing wired glass roof lights. His knee was on a centre glazing bar and the securing arrangement gave way. A crawling board was available but had not been taken to the job. The roof was not covered with fragile materials except for the roof lights.

39 An operator brushing a factory roof fell 6.1 m (20ft) through a translucent corrugated roof light. No crawling boards or other protective equipment were used.

40 A director of a roofing company was using a 'home-made' crawling ladder to replace some tiles on a sloping roof. The ridge hook of the ladder slipped off the roof ridge and he fell 6.7m (22ft).

41 A roofer sitting on an asbestos cement roof sheet lost his balance and fell 9.4m (31ft) through a warehouse roof. The roof was being stripped and re-sheeted. After the accident inertia reel safety belts were provided and used.

42 A roofing operative was dragged over the edge of a flat roof of a four storey building when an electric hoist was pulled over the edge as materials being lifted became snagged in the external scaffolding. The hoist counter weights were not properly secured and the roll of felt being lifted was at right angles to the scaffold ledgers and could not clear them.

43 A slater jumped from a pitched roof onto a scaffold platform 0.9m (3ft) below. The platform was fully boarded out and provided with toe boards. HGe stumbled and plunged between the guard rail and toe board falling 18.3m (60ft).

44 A roofing worker was electrocuted while using a 240 volt electric saw to cut tiles. Several weeks before the accident he cut through the flexible supply lead and repaired it twisting the conductors and taping the joint. The temporary joint pulled apart and the 'live-end' of the lead touched his body.

45 A self-employed-carpenter was carrying out a small repair of an asphalt roof in the light well of a building. He neglected to cover the glass skylight and fell through it while carrying a bucket of hot asphalt. He died from severe burns. The hot asphalt set fire to the building threatening the lives of two residents.

46 A student working during the vacation fell 12.2m (40ft) through an asbestos cement sheet roof of a warehouse. The roof was being inspected before work commenced but it was usual for the experienced employees to walk on the roof bolts. No crawling boards had been taken onto the roof.

47 A casual worker fell 6.4m (21ft) through an asbestos cement sheet factory roof which was being repaired. Stagings had been used in a disorganized manner such that they afforded little protection against falling.

48 A factory worker fell from a valley gutter 6.1 m (20ft) through adjacent cement roof sheets. Stagings and ladders had been used to repair the fragile roof.

But before work commenced on the fitters they were lowered to the ground.

49 A building supervisor fell 6.1 m (20ft) while stepping from a secured ladder onto the flat roof of a school. He was carrying a bucket. The ladder only extended 0.76m (2ft 6in) above the roof.

50 A labourer fell from a system built scaffold while descending using the standards. Access ladders were not provided within the scaffolding and he fell 9.1 m (30ft).

51 Work was almost complete during reslating of a pitched roof when a roofing worker fell 18.3m (60ft) off the edge. The slates were damp; a satisfactory access tower scaffold covered 2.1 m (7ft) but the remaining 4.6m (15ft) was left without roof edge protection.

52 A roofing contractor fell 6.7m (22ft) through an asbestos cement sheet loading bay canopy. He was carrying out a survey of the roof before starting the repairs. No stagings or roofing ladders were used.

53 A self-employed roofing worker was reslating the roof of an old terraced house. The roof ladder was too short to reach the eaves. As he got off the ladder he slipped on the slates and fell 7.6m (25ft) from the unprotected roof edge.

54 A roofing worker fell 11.3m (37ft) through an asbestos cement sheet roof of a factory. He was trying to retrieve his foreman's anorak which had blown onto it and did not heed the foreman's orders not to bother.

55 A factory maintenance manager fell 12.2m (40ft) through a fragile roof. He and a director were inspecting the state of a corrugated asbestos cement pitched roof. The wooden walkway was not secured and slipped causing the manager to fall through the adjacent roof sheets.

56 A painter cleaning a valley gutter at a passenger coach station fell through an adjacent translucent skylight. There were insufficient scaffold boards to cover the fragile roof sheets.

57 A labourer fell 3m (10ft) climbing down coping stones on a party wall. He was attempting to get from the top of a flat dormer roof to a scaffold. A coping stone broke away causing him to fall. Safe access between the dormer roof and the scaffold had not been provided.

58 A farm worker fell through a translucent skylight while clearing debris from an asbestos cement sheet roof of a barn with a brush. The man was walking across the roof purlins which he thought would give him sufficient support.

59 A farm worker cleaning the gutters on the roof of a livestock building fell through a plastic skylight. The accident could have been prevented if the skylight had been covered and a roof ladder provided.

60 A farmer fell 2.7m (9ft) from an unsecured ladder while repairing roof slates on a cow shed. The base of the ladder slipped outwards.

61 A farm worker fell 2.1m (7ft) from an excavator bucket which was mounted on a tractor. The bucket was used as a working platform to enable him to gain access to repair the roof of a farm building. The bucket tilted, a mechanical linkage was worn. The bucket was not designed for such use.

62 An odd job man fell 5.2m (17ft) from a roof of a farm building while replacing slates. A home made cat ladder was used.

63 A farmer fell through a plastic skylight while repairing the asbestos roof of a shippon. Neither a cat ladder nor crawling boards were used

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