University of Salford MANCHESTER

1967 - 2017 50 YEARS

Safety Conservation

Models of Accident Causation

Aims and Objectives

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Aim:

To review and critically examine accident models and to relate this examination to the work environment by means of practical examples.

Objectives:

- ✓Explain the characteristics of the main models of accident causation;
- ✓Critically assess the contribution of these models to the understanding of the accident causation process;
- ✓Explore the practical implications of the models in a business environment.
- ✓Explain the requirements with respect to reporting of accidents and incidents

Accident Definition

An accident is defined by the Health and Safety Executive as:

‘any unplanned event that results in injury or ill health of people, or damage or loss to property, plant, materials or the environment or a loss of a business opportunity’.

‘A short, sudden, unexpected event or occurrence that results in an unwanted and undesirable outcome (Hollnagel).

But, is it actually more meaningful to ask?

What is the **potential** of the accident to cause injury, rather than what injury happened to occur.

Remember, in criminal law, HSE do not have to prove causation and injury to bring a prosecution.

Accident Causation and the role of accident models

In order to anticipate future threats and risks it is necessary to have an idea about how accidents can happen.

Accident Models

- The value of having an accident model is that it can provide a frame of reference for communication.
- It determines how we view an accident and in particular what we think about the role of humans.
- It is a stereotypical way of thinking about accidents.

But, remember …

- All accident models are constructs.
- No single one should be applied and nor should the results be presented as objective facts.
- Hindsight Bias.
- Defences in depth can actually make a system more opaque.
- The role of the human being.

Some important terms

- **Deterministic** - if two events are linked together by means of physical laws there exists a deterministic relationship.
- **Stochastic effects** – those that are governed by the laws of probability.
- **Linearity** – a linear system is one that is reversible i.e. it is possible to find the cause from a knowledge of the event.

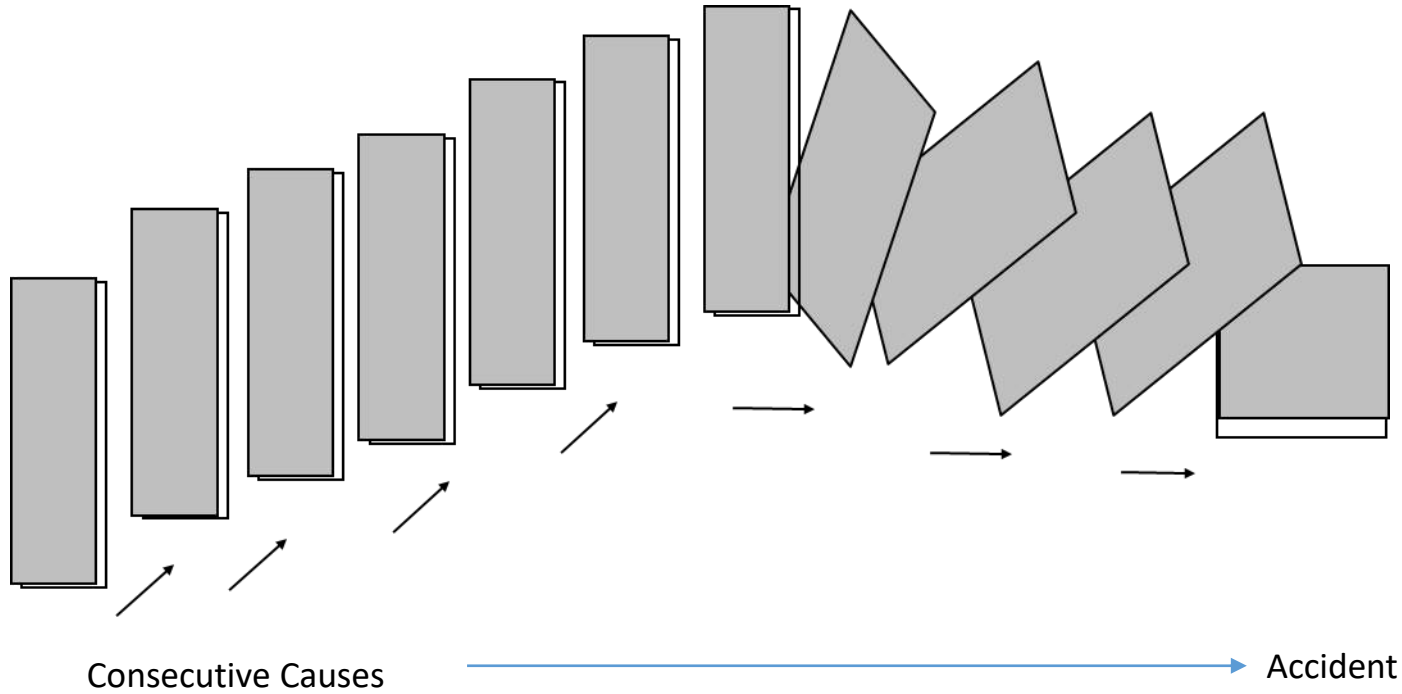
A Case Study: the Herald of Free Enterprise

https://www.youtube.com/watch?v=whvdjg6i2Hc

https://www.youtube.com/watch?v=juk-AJ6xUQo

Sequential Accident Models: Domino Theory or Cascade Failure

Heinrich (1980) was the first to articulate that certain conditions/ precursors are involved in the gestation of an accident i.e. they are not acts of God nor completely unpredictable.



The five “domino” stages (Heinrich et al, 1980).

Inheritance (background) and social environment - leading to

↓

fault of persons - constituting the proximate reason for

↓

an unsafe act caused by a) persons and/or b) unsafe mechanical conditions/mechanical hazard - which results in

↓

the accident which leads to

↓

the injury

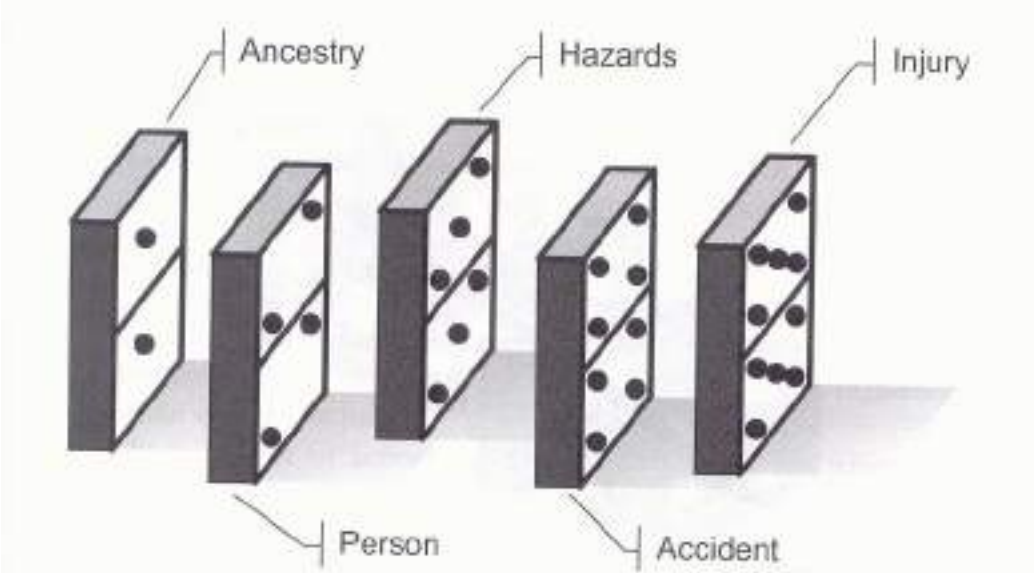


Figure 1.1: Simple linear accident model (Domino model)

Domino Model Assumptions

The accident is invariably caused or permitted directly by the unsafe act of a person and /or a mechanical or physical hazard

The person is largely responsible (blame)

Focus on unsafe acts – what about theories of human error?

Focuses on the immediate causes

Based on the idea that the event can be perfectly reconstructed

Characteristics of Domino Theory

- Linear propagation of the chain of causes and effects with identifiable cause effect links
- Based on the axiom that the occurrence results from a completed sequence of events
- Simple in conception and economic in ideas about mechanisms involved
- The sequential accident model has a clear assumption about causality, specifically that there are identifiable cause-effect links that propagate the effects of the unexpected event
- As long as 'unsafe acts' are the obvious targets, it is easy to concentrate efforts on allocating blame. Consequently, the focus of attention tends not to move beyond identifying potential operator carelessness and negligence or violation of internal rules.
- Hindsight Bias.

Hindsight Bias

- Can be an issue when applying accident causation models.
- Psychological phenomenon in which people exaggerate the predictability of an event after it has happened.
- A psychological effect that leads people to misinterpret the conclusion of accident investigations.
- It is easy to be trapped into over-simplifying the situation and the uncertainties involved.

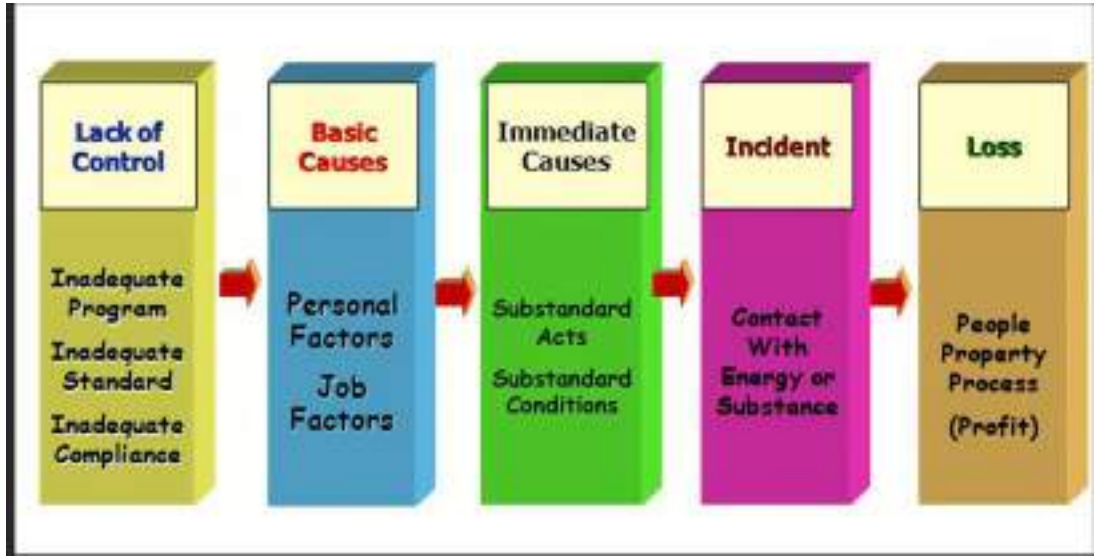
Prevention of Accidents (based on domino theory)

That accident prevention should aim to remove or eliminate the middle or third domino, representing the unsafe act or condition thus preventing the accident e.g., by:

- Persuasion and appeal
- Personnel adjustment
- Improved discipline
- Engineering revision

Sequential Accident Causation Models: Causation & Control (Bird and Loftus 1976)

Bird and Loftus extended Heinrich's theory to encompass the influence of management in the cause and effect of accidents.



Ref: Bird and German 1985

Applying Domino/Linear Accident Causation Models to the Herald of Free Enterprise Disaster?

Human Error? Crew

- The HERALD capsized because she went to sea with her inner and outer bow doors open.
- The Assistant Bosun, accepted that it was his duty to close the bow doors at the time of departure from Zeebrugge and he failed to carry out this duty.
- Bosun – last man on G-Deck who noticed the doors open. He said “It has never been part of my duties to close the doors or make sure anybody is there to close the doors.”

Human Error? Captain

- Captain Lewry took the HERALD to sea with the bow doors fully open.
- He was competent and experienced.
- Standing Order company issued: “Heads of Departments are to report to the Master immediately they are aware of any deficiency which is likely to cause their departments to be unready for sea in any respect at the due sailing time. In the absence of any such report the Master will assume, at the due sailing time, that the vessel is ready for sea in all respects”
- Masters came to rely upon the absence of any report at the time of sailing as satisfying them that their ship was ready for sea in all respects. That was, of course, a very dangerous assumption.
- Captain Lewry saw the Chief Officer come to the Bridge. Captain Lewry did not ask him if the ship was all secure and the Chief Officer did not make a report.

Departure conditions

- Both the weight of the ship (by approx. 250 tonnes) and the freight carried (by 13%) were heavier than allowed for. The probability is that the draught and trim approached the upper limit condition and that the ship was in fact overloaded significantly at departure – but did not cause the accident.

- Practice to curb speed going out when the ship was trimmed to head, but when passed the sea wall the captain increased her speed, possibly to maximum speed, from the Bridge.

Rasmussen' Risk Management Framework (1997)

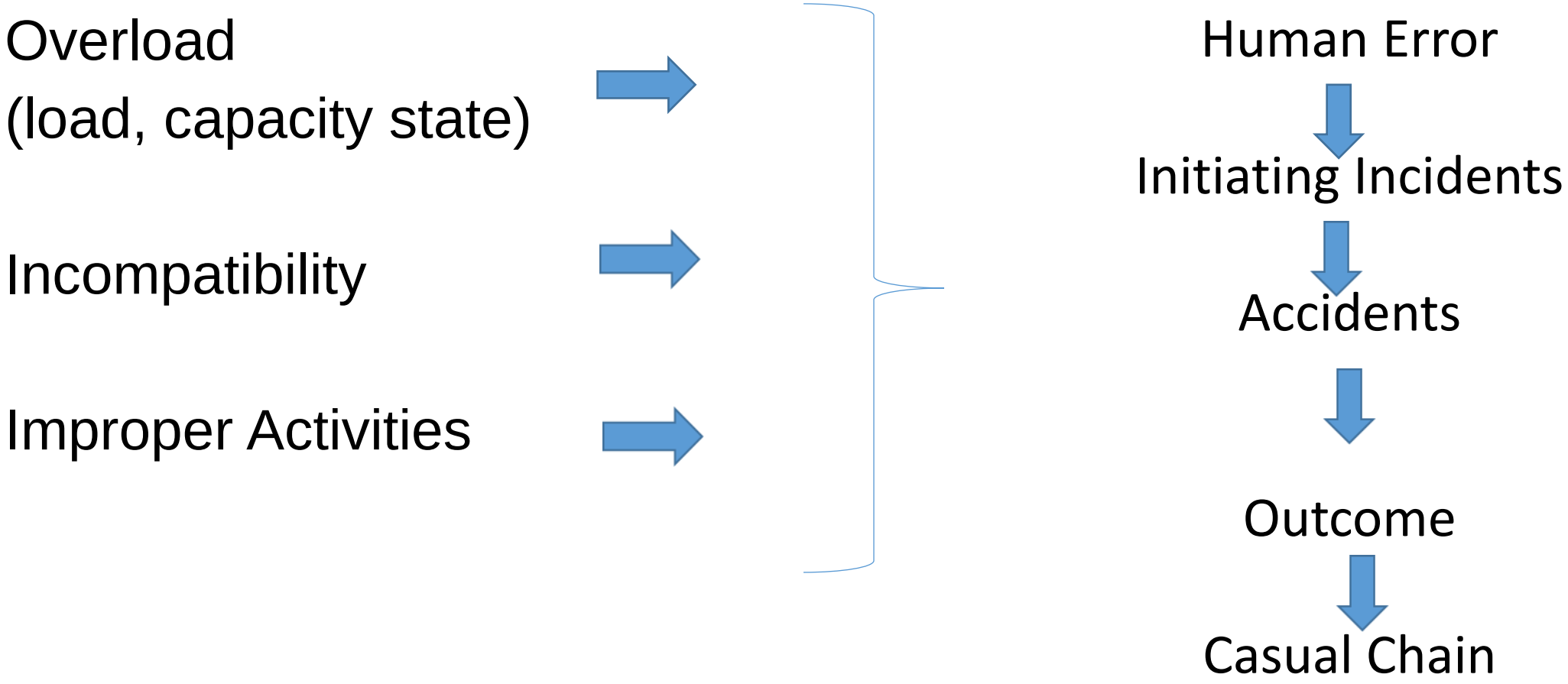
- Decisions and actions at all levels of the system interact with one another to shape system performance
- Decisions and actions made at higher governmental, regulatory, and managerial levels of the system should propagate down and information at the lower levels regarding the system's status needs to transfer up the hierarchy -'vertical integration'.

On issues with simple, linear models:

- An event will be accepted as a cause and the search (for further facts) terminated if the causal path can be followed no longer, or a familiar, abnormal event is found which is therefore accepted , and a cure is known.
- Expediency linked together with linear causation models have thus restricted many investigations. The identification and control of contributing causes has been severely limited.

Towards multi-causality …

Ferrell's (1980) human factors of overload

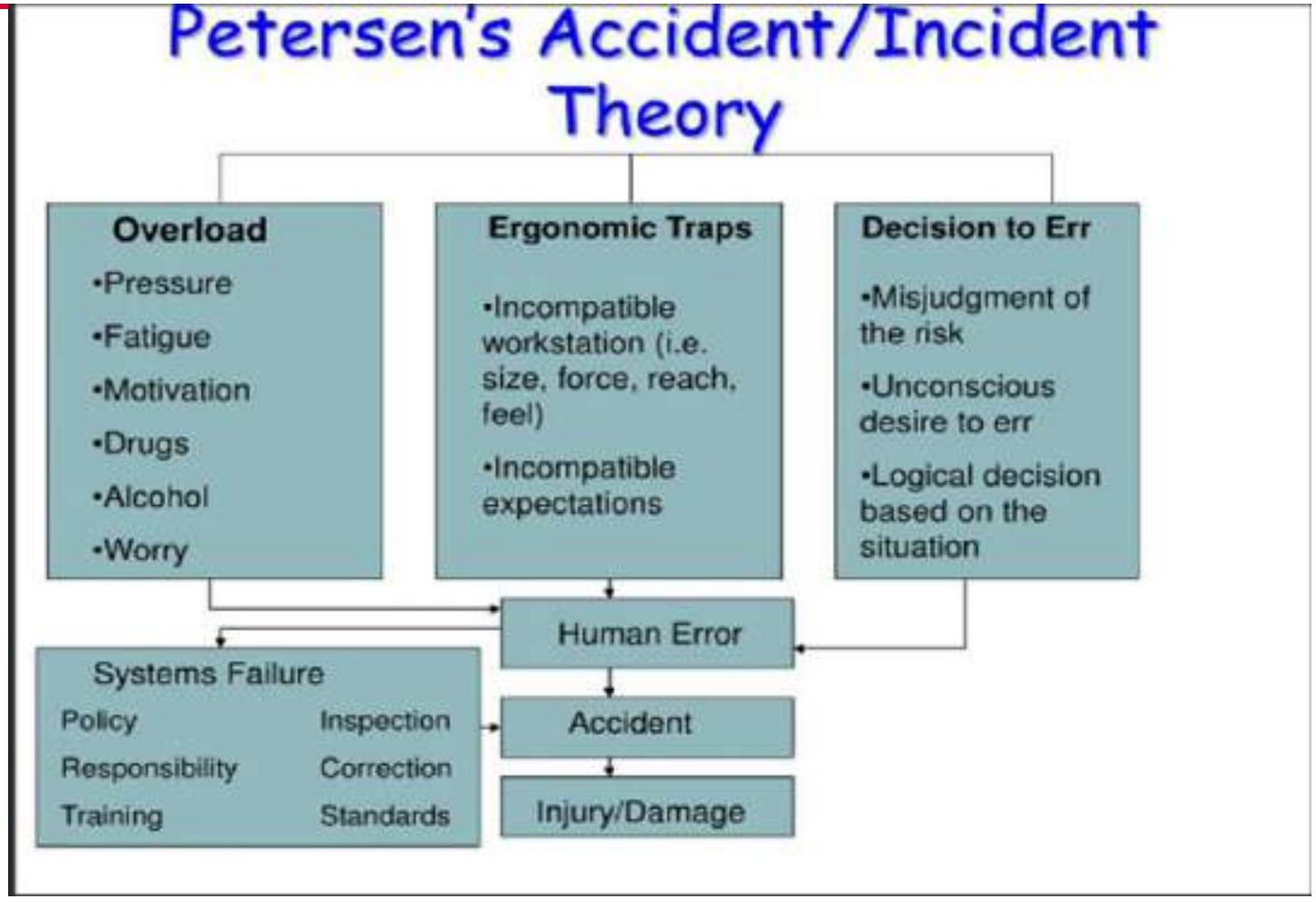


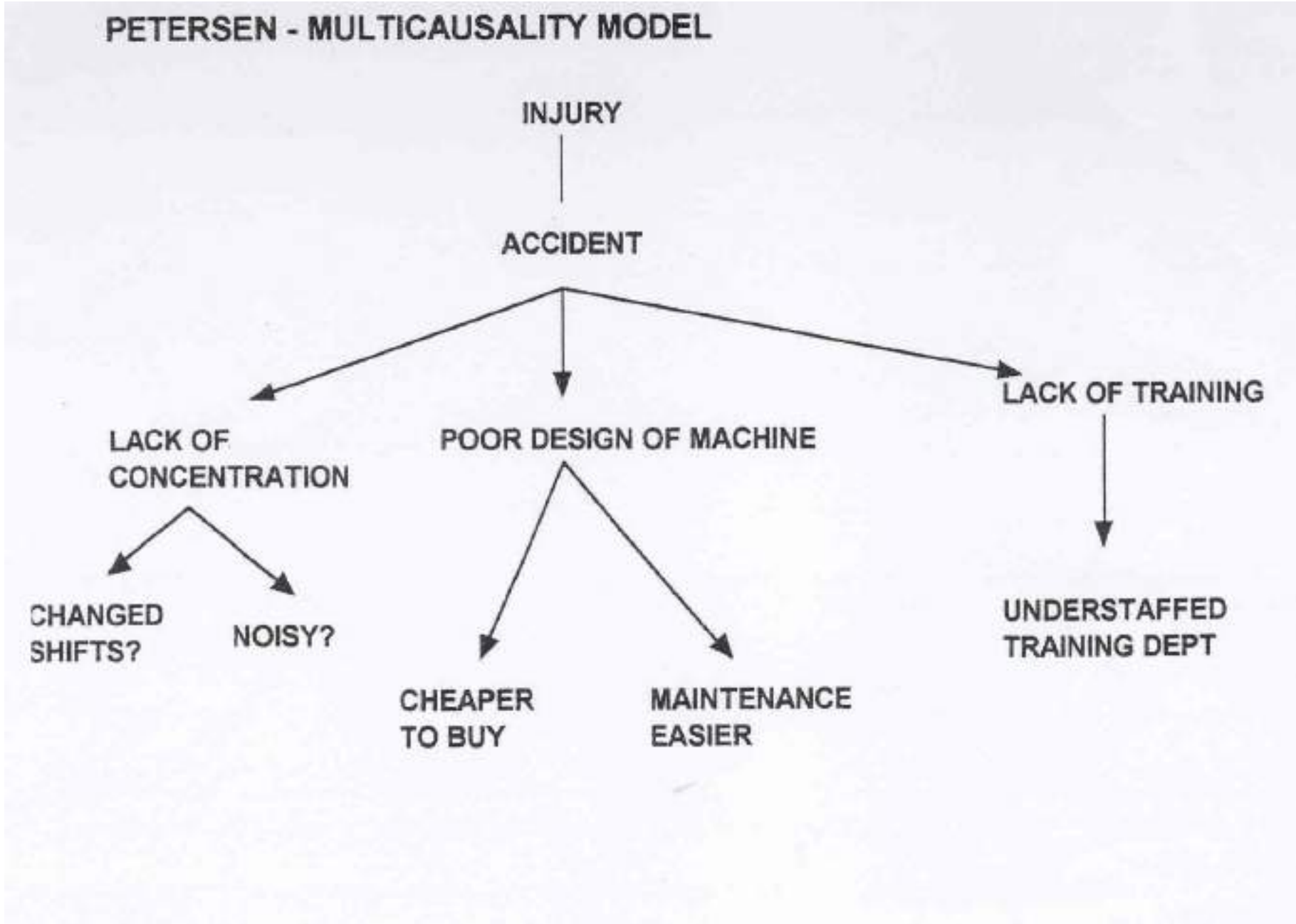
Multi-causality

Behind every accident there lie many contributory factors, causes and sub-causes.

These combine in random fashion causing accidents.

(Peterson et al)





Peterson on Symptoms and Causes

"We have tended to become confused over the years concerning our definition of accident causes. We have considered unsafe acts and conditions to be causes of accidents, and the things that allowed the acts or produced the conditions we have thought of as personal factors or sub-causes".

If we deal only at the symptomatic level i.e., the immediate act or condition, we end up removing symptoms and allowing root causes to remain.

To achieve permanent improvements, we must deal with root causes of accidents.

Root Cause and Basic Cause

Root Cause - ‘the most basic cause that can be reasonably identified and that management can fix.’

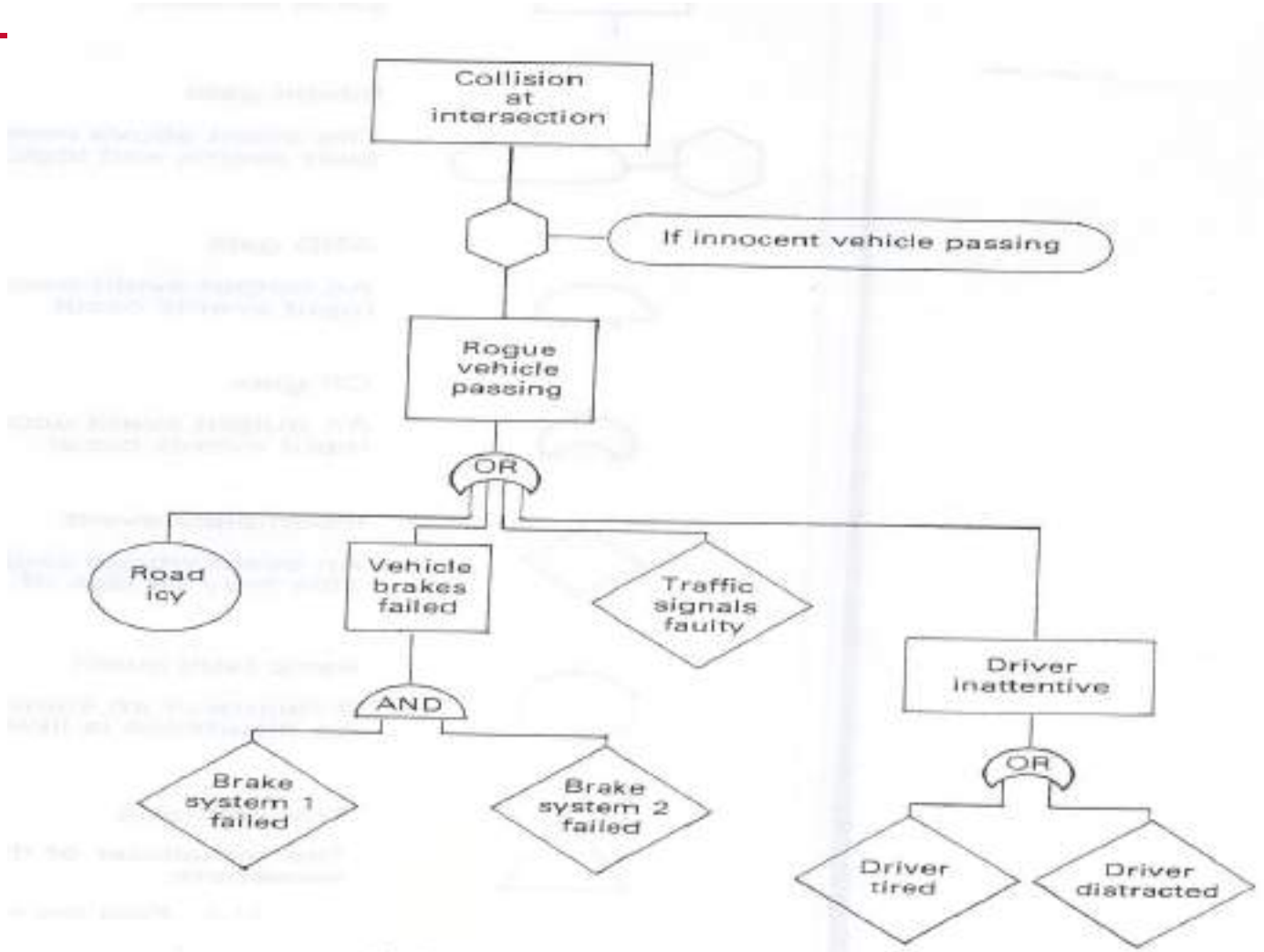
Basic cause – are specific reasons as to why an incident has occurred that enable recommendations to be made which will prevent recurrence of the event leading up to the incident

Fault Tree Analysis

A fault tree is a symbolic logic diagram that shows the (assumed) cause and effect relationship between an undesirable event and one or more contributing causes.

Beginning with the undesired event the FT analysis uses backward reasoning tracking events that could have led to the unwanted happening. This is a visual representation of the relationship between the causes that led up to the accident.

Fault tree for collision at intersection



11.8 Fault tree for collision at intersection

Systems Thinking

Reductionist Thinking: usually we are trained to think systematically, in a style that is often termed reductionist i.e. breaking down the problem into their individual elements.

The complexity is simplified by dividing the problem into sub problems or lesser components.

Systems Thinking: a conceptual way of analysing organisations and problem solving.

System thinking is useful for tackling issues that are embedded in complexity, particularly where that includes human activity.

Turner's work (1978)

- He searched for common preconditions in organisations which had experienced large scale accidents. He identified a set of preconditions which he argued were organisational and underlying in many maritime and mainland causes.

- He established the concept of an 'accident waiting to happen' being an ill-defined problem.

Ref: B. A. Turner, N. E. Pidgeon, Man-made Disasters

Turner cont'd …

Features which can form part of the incubation stage in a sequence of disaster development - accumulating unnoticed include:

- Rigidities in perception and beliefs in organisational settings
- Information difficulties
- Involvement of strangers especially on complex sites
- Failure to comply with existing regulations
- Minimising emergent dangers

Organisational Accidents

Have multiple causes involving many people operating at different levels of their respective companies

Whilst they may be truly accidental in the way various contributing factors combine to cause an adverse outcome, there is nothing accidental about the existence of the precursors, nor the conditions which create them

It is the multiplicity of overlapping and mutually supporting defences that makes complex technological systems, largely proof against single failures (technical or human). Consequently, in these types of organisations there are very few individual accidents.

All organisational accidents entail the breaching of the barriers and safeguards that separate damaging and injurious hazards from vulnerable people and assets.

Reason on Organisational Accidents – review of disasters

- All accidents occurred within complex systems which had made considerable efforts and devices for defences in depth.

- Each accident arose from an adverse conjunction of human failures, the most significant of which were committed long before the accident sequence was apparent.

Ref: Reason, J., (1997) Managing the Risks of Organisational Accidents. Ashgate Publishing

James Reason (1990) Swiss Cheese Model of Accident Causation –

Active Failures and Latent Conditions

Active failures – unsafe acts (errors and violations) at the sharp end that have a direct and immediate impact on the safety of the system. Active failures tend to be unique to a specific event.

Latent conditions – like resident pathogens in the body, present for many years and combine with local circumstances and active failures to penetrate the system of defences. They can arise from strategic and other top-level decisions. The same latent conditions can contribute to several different accidents.

Latent conditions can increase the likelihood of active failures through the creation of local factors promoting errors and violations. They can also aggravate the consequences of unsafe acts by their effects on systems defences.'

Reason's (1990) Swiss Cheese Model

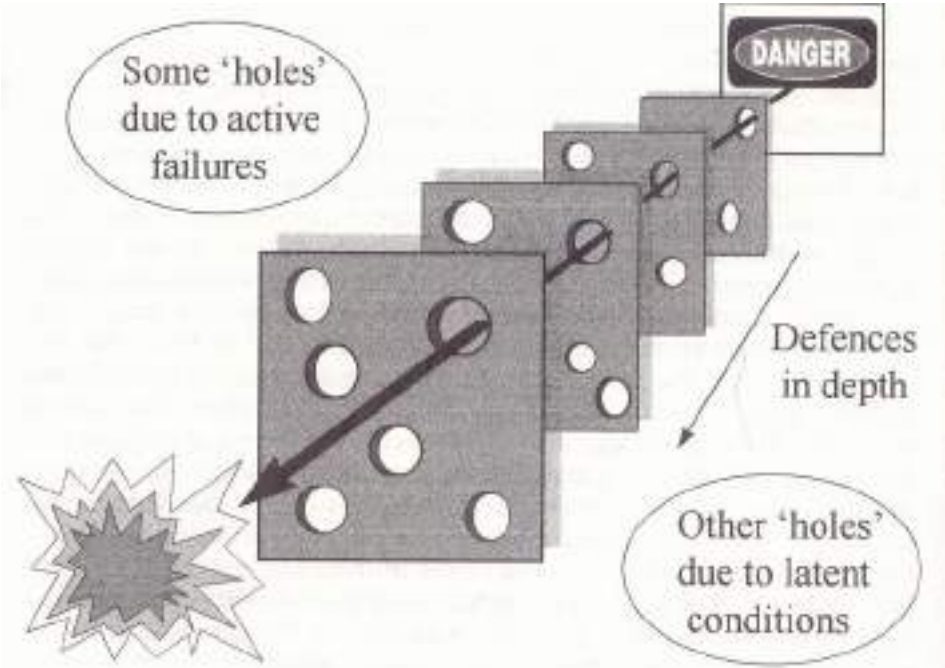


Figure 1.5 An accident trajectory passing through corresponding holes in the layers of defences, barriers and safeguards.
The holes can be created by active and latent failures.

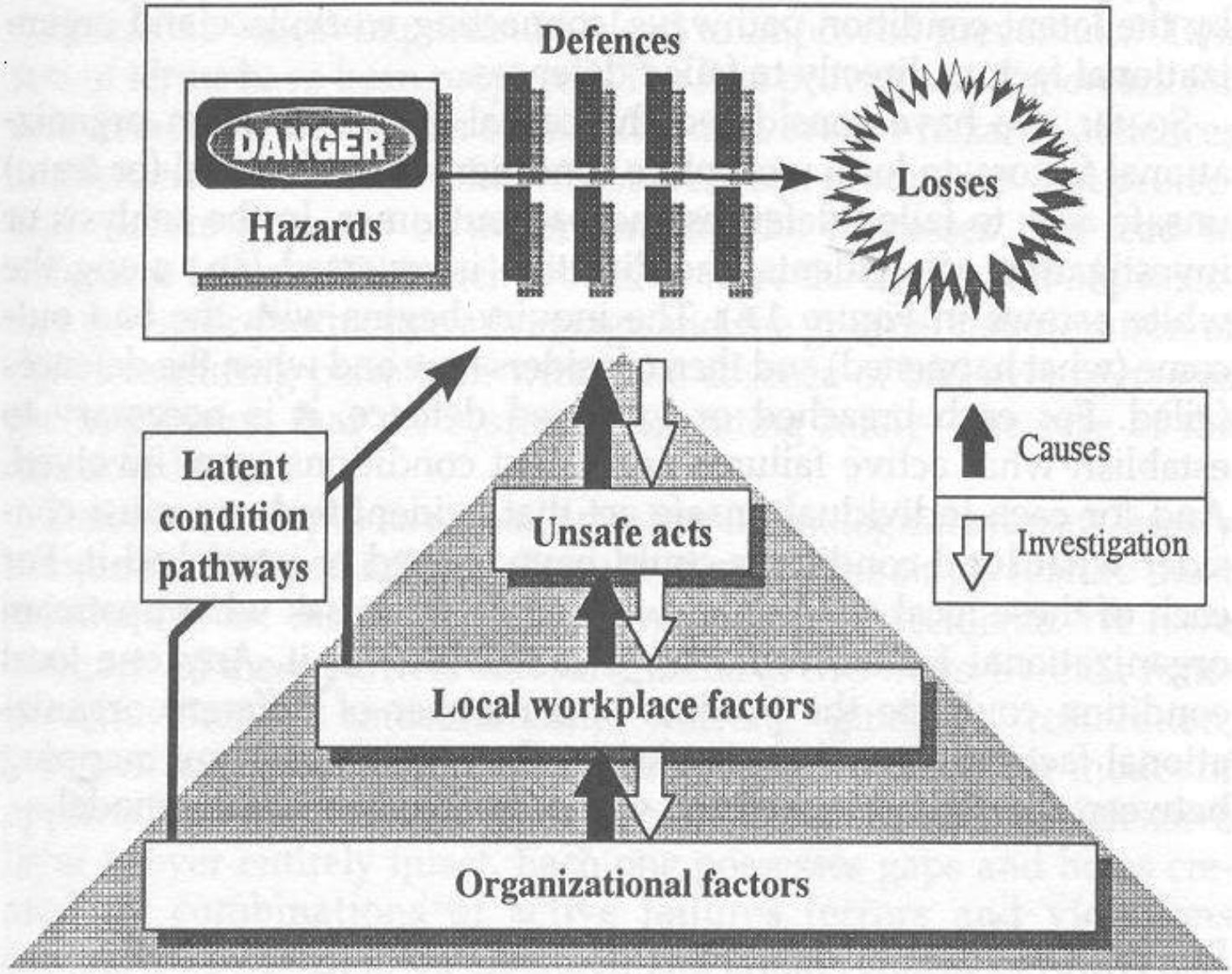
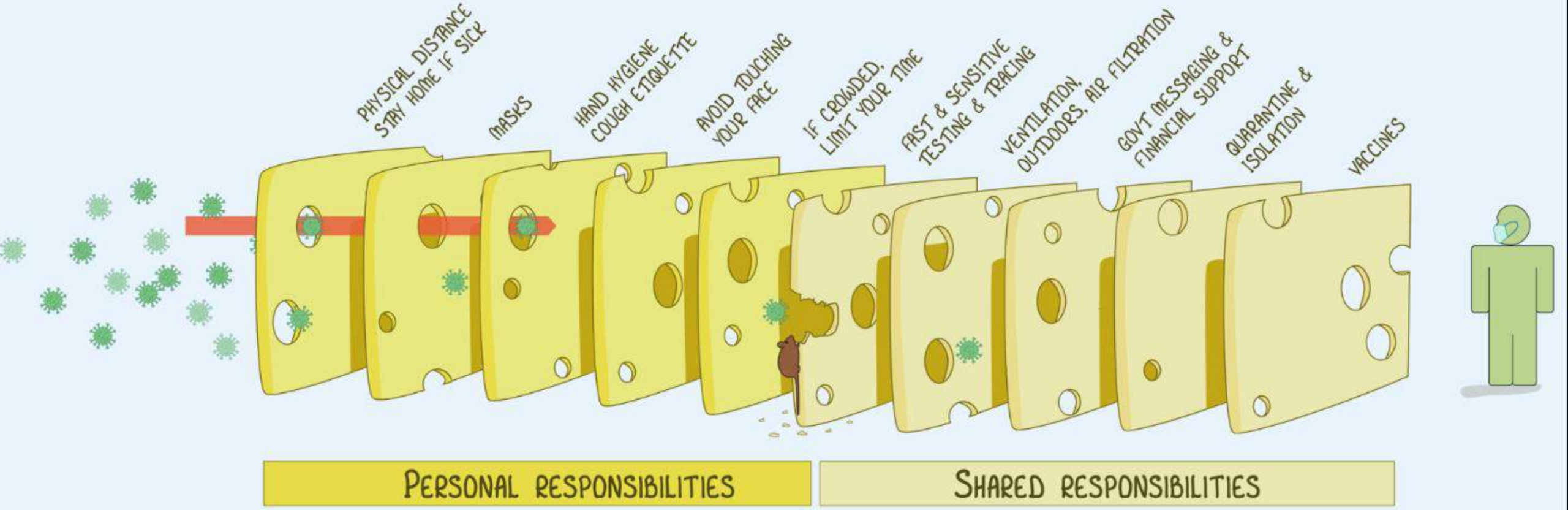


Figure 1.6 Stages in the development and investigation of an organizational accident

The Swiss Cheese Respiratory Virus Pandemic Defence

Recognising that no single intervention is perfect at preventing spread



Each intervention (layer) has imperfections (holes).
Multiple layers improve success.

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With thanks to Jody Lanard, Katherine Arden & the Uni of Qld
Based on the Swiss cheese model of accident causation, by James T Reason, 1990
version 3.0
update: 24oct2020

Defences in depth

- Largely achieved through a mix of hard and soft applications
- They can make systems more complex and opaque

Holes in Defences: Preferably all defences would be intact, but in reality each layer has its weaknesses and gaps. These are not fixed and static but constantly in flux.

Accident Trajectory: The necessary condition for an organisational accident is the rare conjunction of a set of holes in the successive defences allowing hazards to come into damaging contact with people and assets.

Functions of Defences

- To create understanding and awareness of the local hazards.
- To give clear guidance on how to operate safety.
- To provide alarms and warnings when danger is imminent.
- To restore the system to a safe state in an off normal situation.
- To interpose safety barriers between the hazards and the potential losses
- To contain and eliminate the hazards should they escape this barrier
- To provide means of escape and rescue should hazard containment fail.

Applying Multi-Causality Accident Causation Models to the Herald of Free Enterprise Disaster?

Herald of Free Enterprise Disaster

The Route

- This ship designed for Dover-Calais.
- Reduced senior level staff on Dover-Zeebrugge
- Ship not built for docks at Zeebrugge – new procedures, including filling ballast tank, required to allow loading to all decks.
- The turn-around at Zeebrugge completely different than at Calais – but no accommodation was given. Chief Officer under pressure to leave loading deck as soon as complete.
- Standing Orders were not adequate and did not fully consider the differences on the Zeebrugge route.

Herald Free Enterprise:

Causes continued …

Pressure to leave the berth in Dover

- the officers always felt under pressure to leave the berth immediately after the completion of loading. The practice was for the officer on the car deck to call the bridge and tell the quartermaster to give the order “harbour stations” over the Tannoy. Frequently the order “harbour stations” was given before loading was complete. This conflicted with the duties regarding closing the doors.

Failure to act on warnings/safety culture

- The conflict was brought to the attention of the company by a memorandum dated 21st August 1982 from Captain Hackett, Senior Master of FREE ENTERPRISE VIII in which he said:- “Departure from Port - It is impractical for the Chief or Second Officer) to be on the Bridge 15 minutes before sailing time. Both are fully committed to loading the ship. At sailing time, the Chief Officer stands by the bow or stern door to see the ramp out and assure papers are on board etc. The Second Officer proceeds to his after mooring station to assure that the propellers are clear and report to bridge. The order illustrates the lack of thought given by management to the organisation of the officers’ duties.

- Operations Director at Zeebrugge: ““There seems to be a general tendency of satisfaction if the ship has sailed two or three minutes early. Where, a full load is present, then every effort has to be made to sail the ship 15 minutes earlier . . . . . I expect to read from now onwards, especially where FE8 is concerned, that the ship left 15 minutes early . . . . . put pressure on the first officer if you don’t think he is moving fast enough. Have your load ready when the vessel is in and marshal1 your staff and machines to work efficiently. Let’s put the record straight, sailing late out of Zeebrugge isn’t on. It’s 15 minutes early for us.”

Herald Free Enterprise: Learning from Systems Failure

- In October 1983 the assistant bosun of the PRIDE had fallen asleep and had not heard “Harbour Stations” being called, with the result that he neglected to close both the bow and stern doors on the sailing of the vessel from No. 5 berth, Dover.
- A general instruction issued in July 1984 prescribed that it was the duty of the officer loading the main vehicle deck (G deck) to ensure that the bow doors were “secure when leaving port”. That instruction had been regularly flouted. It was never enforced.
- At least 5 times one of their ships had proceeded to sea with the bow doors open.
- Previous concerns raised by Masters, not actioned:
  - Complaints that ships proceeded to sea carrying passengers in excess of the permitted number.
  - The wish to have lights fitted on the bridge to indicate whether the bow and stern doors were open or closed.
  - Draught marks could not be read. Ships were not provided with instruments for reading draughts. At times ships were required to arrive and sail from Zeebrugge trimmed by the head, without any relevant stability information.
  - The wish to have a high-capacity ballast pump to deal with the Zeebrugge trimming ballast.

Herald Free Enterprise: Learning from Systems Failure – a warning light

- “4. Mimic Panel - There is no indication on the: bridge as to whether the most important watertight doors are closed or not. That is the bow or stern doors. With the very short distance between the berth and the open sea on both sides of the channel this can be a problem if the operator is delayed or having problems in closing the doors. Indicator lights on the very excellent mimic panel could enable the bridge team to monitor the situation in such circumstances.” Captain Blowers of the PRIDE.

- Company response:
  - “Do they need an indicator to tell them whether the deck storekeeper is awake and sober? My goodness!!”
  - “Nice but don’t we already pay someone!” “Assume the guy who shuts the doors tells the bridge if there is a problem.” “Nice!”

- “Another incident has occurred to remind me of my request of some time ago for bridge indication of the position of the bow and stern watertight doors. I still feel that although it is the duty of a crew member to check the position of the doors visually prior to proceeding to sea, it is so important to the safety of the ship that they are closed that we should have bridge indication. We have indicators for many pieces of equipment on the bridge, many of which should be checked visually in another part of the ship e.g. main engine bridge stands connected, bow thrusts on the board etc., and I feel that the bow and stern doors are every bit as important as these. Is the: issue still being considered or has it been considered too difficult or expensive?” 9/10/86 Cpt de Ste Croix

The company’s response: “I cannot see the purpose or the need for the stern door to be monitored on the bridge, as the seaman in charge of closing the doors is standing by the control panel watching them close.”

“If the sensible suggestion that indicator lights be installed had received, in 1985, the serious consideration

which it deserved, it is at least possible that they would have been fitted in the early months of 1986 and this disaster might well have been prevented”.

Herald Free Enterprise: the Company Management

- At first sight the faults which led to this disaster were the aforesaid errors of omission on the part of the Master, the Chief Officer and the assistant bosun, and also the failure by Captain Kirby to issue and enforce clear orders. But a full investigation into the circumstances of the disaster leads inexorably to the conclusion that the underlying or cardinal faults lay higher up in the Company.

- The Board of Directors did not appreciate their responsibility for the safe management of their ships. They did not apply their minds to the question: What orders should be given for the safety of our ships? The directors did not have any proper comprehension of what their duties were.

- There appears to have been a lack of thought about the way in which the HERALD ought to have been organised for the Dover/Zeebrugge run.

- All concerned in management, from the members of the Board of Directors down to the junior superintendents, were guilty of fault in that all must be regarded as sharing responsibility for the failure of management.

- Hon. Mr Justice Sheen **“From top to bottom the body corporate was infected with the disease of sloppiness”.**

- The failure on the part of the shore management to give proper and clear directions was a contributory cause of the disaster.

Herald Free Enterprise: the Company Statement

“Townsend Car Ferries recognise that long before the 6th March 1987 both their sea and shore staff should have given proper consideration to the adequacy of the whole system relating to the closing of doors on this class of ship with their clam doors. If they had, they should, and would, have improved the system notably by first improving their instructions, at the very least by introducing in the Bridge and Navigation Procedures Guide an express instruction that the doors should be closed, secondly by introducing a positive reporting system, thirdly by ensuring that the closure of the doors was properly checked and, fourthly, by introducing a monitoring or checking system”.

The Outcome of the Investigation by Hon. Mr Justice Sheen

“The capsizing of the HERALD OF FREE ENTERPRISE was partly caused or contributed to by serious negligence in the discharge of their duties by Captain David Lewry (Master), Mr. Leslie Sabel (Chief Officer) and Mr. Mark Victor Stanley (Assistant bosun), and partly caused or contributed to by the fault of Townsend Car Ferries Limited (the Owners).

The court suspends the certificate of the said Captain David Lewry for a period of one year from the 24th July 1987. The Court suspends the certificate of the said Mr. Leslie Sabel for a period of two years from the 24th July 1987”. (Department of Transport 1987).

Townsend ordered to pay £50,000 (in total) to the crew and surviving dependents.

Townsend ordered to pay £350,000 to the Department of Transport towards the costs of the investigation.

Grenfell Tower Fire Tragedy - 2017

72 people lost their lives that night in June 2017.

Active Failure: external cladding was flammable and breached compartmentation between flats/floors.

Latent Conditions:

- Lack of expertise in insulation and cladding - no-one realised the danger posed by the cladding panels.
- Cost more important than safety?
- Corners were cut.
- Ignored previous warnings from tenants – e.g. one in 2014

Systems thinking and Accident Causation

Systems model theory approaches the relationship between persons and their environments differently. Rather than the environment being full of hazards and a person being error prone, a system model view sees a harmony between man, machine, and environment.

Under normal circumstances, the chances of an accident are very low. Once someone or something disrupts this harmony by changing one of the components or the relationships between the three, the probability of an accident occurring increases substantially

Systems thinking allows us to describe, explain and predict the behaviour of complex organisation systems. Enabling the recognition that the major residual health and safety problems do not reside exclusively in either the technical or social aspects of the systems but at the interfaces.

Systems Thinking … some thoughts

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"When we think about health and safety, as an example, systems have what we call emergent properties. Safety is something that emerges from the interaction of our system, including leadership processes, culture, worker participation and evaluation metrics." (Howe 2021)

Howe explains that OHSMS performance isn't the sum of the parts of the system, but the product of their interaction. To improve OHSMS, you have to concentrate on the underlying interactions and not just focus on symptoms.

Many organizations think about safety and health as pieces, functions and activities separate from the rest of the system. This may not only impede improvement, but it may also cause unintended consequences.

High Reliability Organisations

It is the multiplicity of overlapping and mutually supporting defences that makes complex technological systems, largely proof against single failures (technical or human).

Consequently, in these types of organisations there are very few individual accidents.

To recap:

Accidents … do not arise from single causes. They occur through the unforeseen concatenation of several distinct factors, each one necessary but singly insufficient to cause the catastrophic breakdown….

This view leads to several general assumptions about accident causation …

- The likelihood of an accident is a function of the total number of pathogens (or latent failures) resident within the system
- The more complex, interactive and opaque the system … the greater will be the number of resident pathogens
- The higher an individual's position within an organisation, the greater is his or her opportunity for generating pathogens;
- It is virtually impossible to foresee all the local triggers, though some could and should be anticipated. Resident pathogens, on the other hand, can be assessed, given adequate access and system knowledge.

And therefore …

The efforts of safety specialists could be directed more profitably towards the pro-active identification and neutralisation of latent conditions, rather than at the prevention of active failures, as they have largely been in the past.

Reason: a critique

- Based on a notion of causality - the causal links between distant latent conditions and accidents are often tenuous.
- Latent conditions can always be identified – with or without an accident.
- Some latent conditions may be very difficult to control or may take years to address.
- Misapplication of the model can shift the blame backwards .
- Focuses on failures/deviations rather than normal working
- Overzealous implementation can lead to an illusion of management responsibility for all errors.
- Active errors may be the dominant factors after all i.e., any errors are simply the by-product of normal adaptive cognitive processes. Inadequate defences would make the errors more dangerous, but even then, some errors would overcome even well planned and maintained defences.

Perrow's Normal Accident Theory (1984)

- Systems approach
- Accidents are natural occurrences because of the growing complexity of the system, tight couplings and the concomitant human inability to understand them.
- Barriers and redundancy introduced to limit accidents have added to complexity and increased opacity
- Humans are unable to control them directly or indirectly

But, Perrow's model …

- Offers no solutions
- What about 'none' normal accidents with organisational precursors?
- What about disasters such as Bhopal, Chernobyl and Challenger which are excluded as component failure accidents and 'alarmingly banal examples of organisational elites not trying very hard' (Perrow1994;218).

High Reliability Theory

Many of the systems that Perrow describes e.g., aircraft and airways, nuclear power – are in fact remarkably free from major accidents.

It is not that these organisations are error-free but that errors do not disable them.

Mindful management

Avoiding Accidents?

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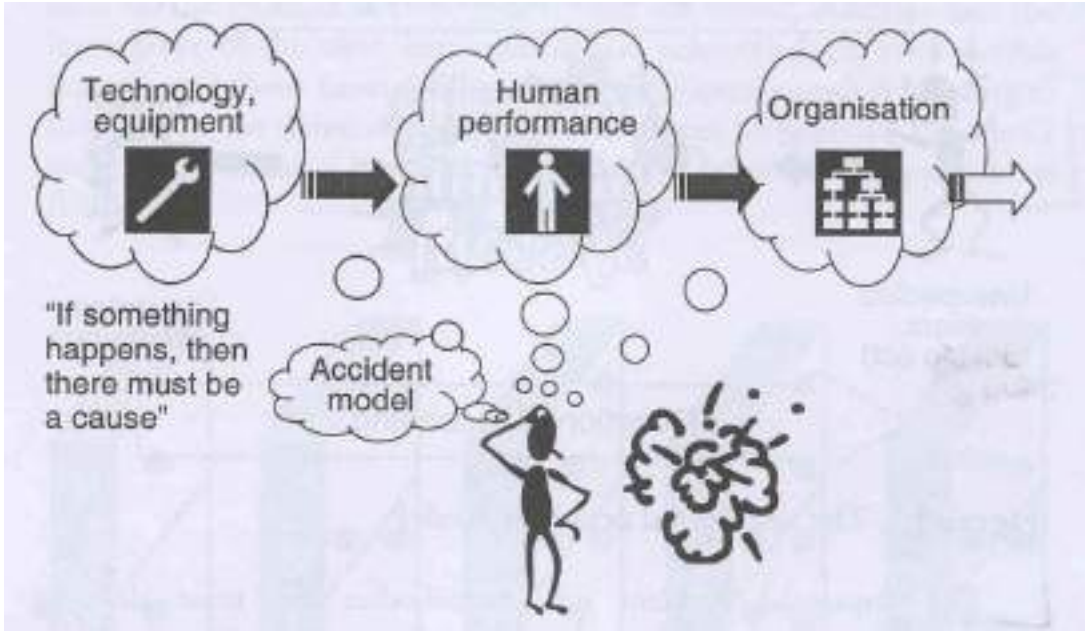
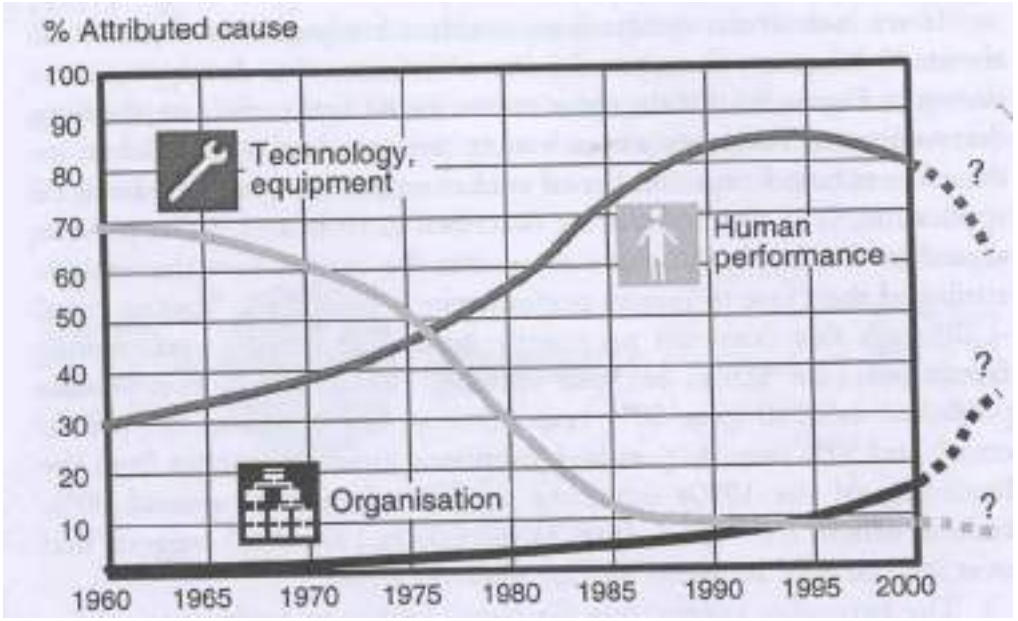
The ‘constant’ accident model





Hollnagel (2004)

- Should look for explanations rather than causes – but the search for explanations is often based on the incorrect assumption that explanations can be deduced from the facts.

- Accidents are characterised as a series of events each with their own sharp-end and blunt-end that come together in an unpredictable way.

- Accidents are not a simple progression - the backward search for a cause is likely to reveal a complex network rather than simple cause and effect chain. The effect (output) is not proportional to the cause

Dimensions of Resilience

- Preparedness/Anticipation: is the organisation proactive in picking up on evidence of developing problems versus only reacting after problems become significant?
- Opacity/Observability: does the organisation monitor safety boundaries and recognise how close it is to “the edge” in terms of degraded defences and barriers?
- To what extent is information about safety concerns widely distributed throughout the organisation at all levels versus closely held by a few individuals?
- Flexibility/Stiffness: how does the organisation adapt to change, disruptions, and opportunities?
- Revised/Fixated: how does the organisation update its model of vulnerabilities and the effectiveness of countermeasures over time?

Basics of Resilience Engineering

- Detecting the signs of increasing organisational risk, especially when production pressures are intense or increasing – e.g. that cross checks are working effectively;
- Having the resources and authority to make extra investments in safety at precisely these times when it appears least affordable;
- Having a means to recognise when and where to make targeted investments to control rising signs of organisational risk and re-balance the safety and production trade-off.

Accident Proneness?

Farmer and Chambers (1926) Examined the accident record of a large group of drivers and found that a few had more accidents than other people did. They used personality tests to try to identify the personality traits that might account for this apparent tendency. Although they found nothing conclusive, they were still convinced of the existence of 'accident proneness' i.e., a personal idiosyncrasy of relative permanence predisposing the individual who possesses it to a marked degree to a relatively high accident rate.

Glendon and McKenna (1995) seems that there may be a number of factors that may predispose people to having accidents, but the stability of those factors in any one person is questionable.

Reason: Examination of accident repeaters over a lengthy period indicates that they are members of a club which is continuously changing membership. New people are added, while long standing members cease to qualify. It is possible that in some people it is a passing phase while in others it is more enduring.

Lawton and Parker (1998) Little evidence to support a grand theory of accident proneness. Accidents can arise from two different classes of behaviour.

- Cognitive factors such as attentional capacity, perceptual abilities and knowledge are known to be important factors underlying errors.
- Deliberate risk taking are more likely to be explained by a consideration of attitudinal and motivational factors. Personality factors such as extroversion/introversion may have a role in both errors and violations.

Some writers posit that there are 2 types of accident proneness: a temporary state resulting from stress or life events; or a stable trait.

Fallibility and the Role of the Human Being in Accidents

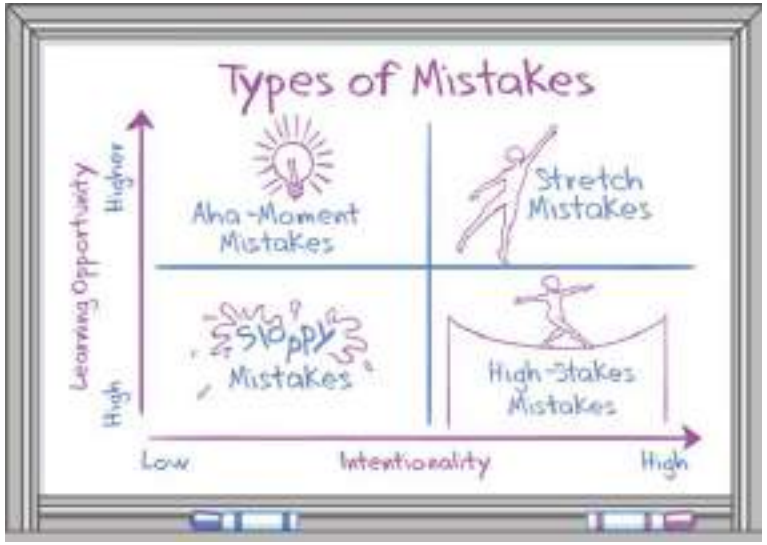
"A life spent making mistakes is not only most honourable but more useful than a life spent doing nothing" - George Bernard Shaw

"It is well to cultivate a friendly feeling towards error, to treat it as a companion inseparable from our lives, as something having a purpose which it truly has." - Maria Montessori

Human Factors vs Fallibility factors

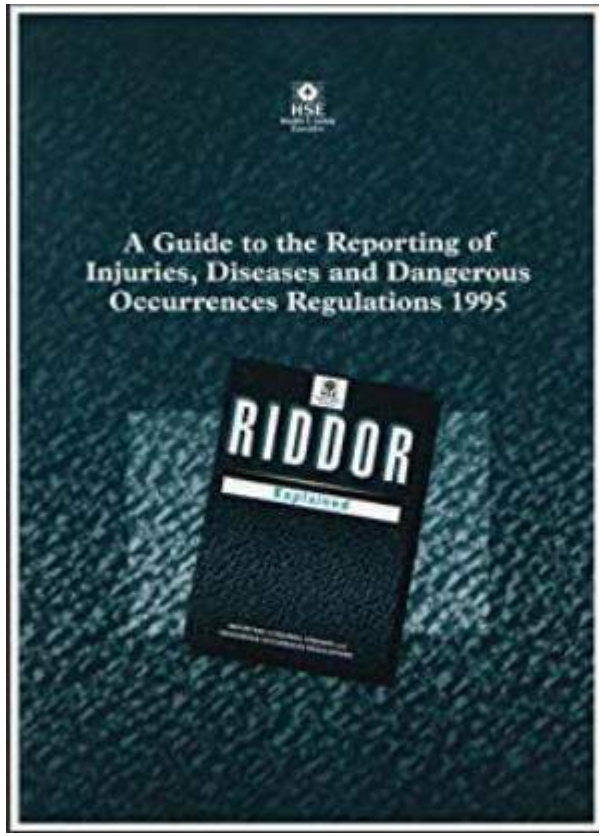
Fallibility is the character, status, quality, nature and the enduring permanence of being a human person. Fallibility is essential for learning and risk. Fallibility is the wonderful eternal gift that makes what it is to be human. (Long 2022)

Long (2022) posits that '[In] Human Factors there is never a discussion about 'being' human but always about humans as a 'factor' in a system' – thus de-humanising people and leading to ethical concerns.

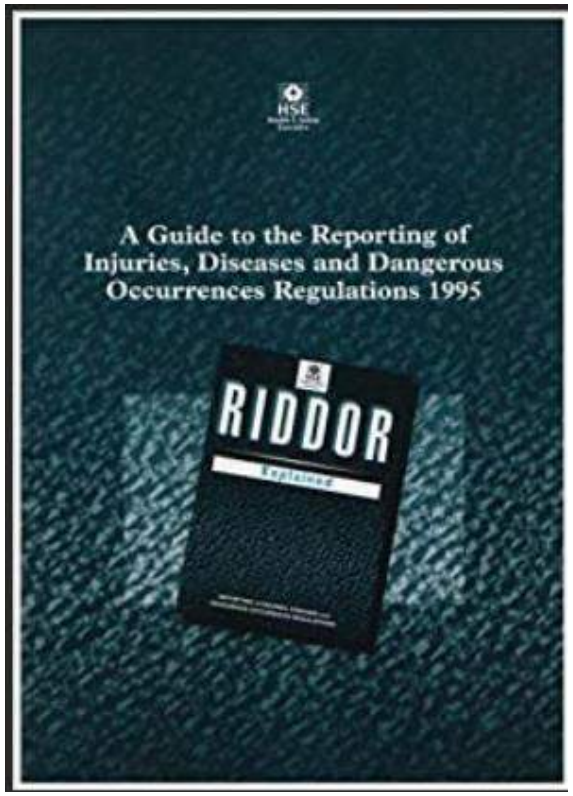


Ref: Eduardo Briceño (2015)

Workplace Requirements re the Recording, Reporting and Investigation of Accidents



Key figures for Great Britain (2018/19)



111 workers killed at work

693,000 working people sustain an injury at work according to the Labour Force Survey

65,427 injuries to employees reported under RIDDOR

38.8 million working days lost due to work-related illness and workplace injury

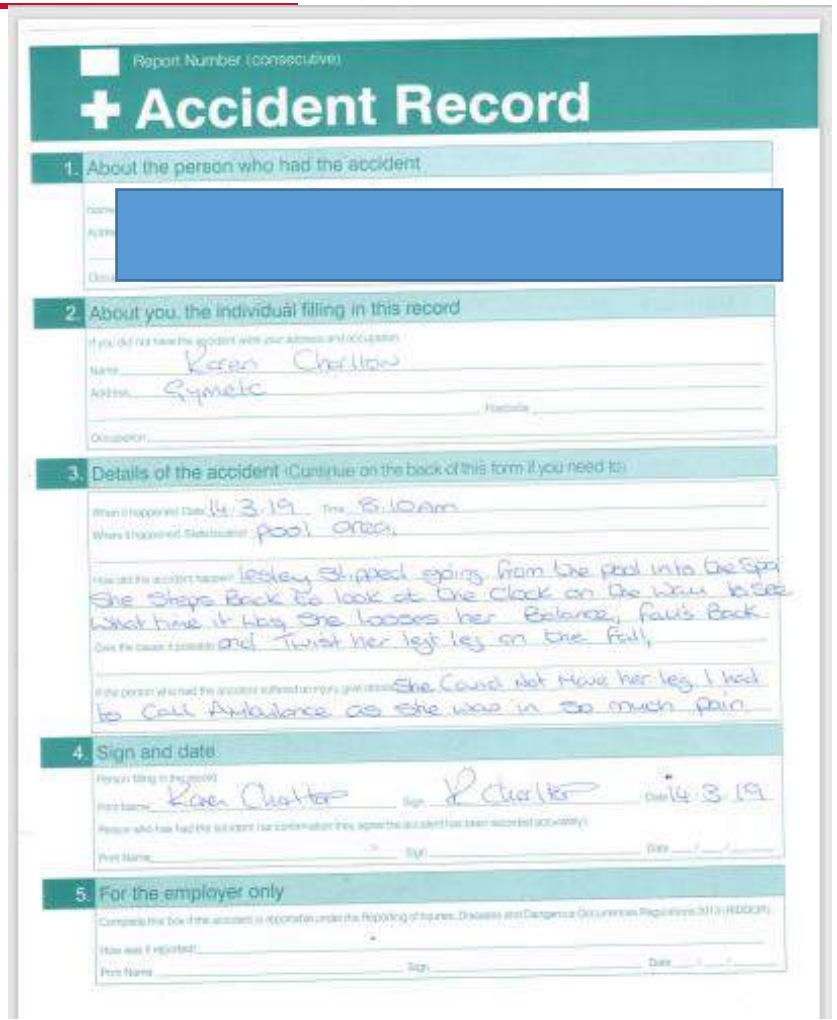
£16.2 billion estimated cost of injuries and ill health from current working conditions

Accident Records

HSE Forms or own systems.

Data Protection (GDPR)

Enough information to initiate an investigation.



Report Number (consecutive)

+ Accident Record

1. About the person who had the accident

2. About you, the individual filling in this record

Name Karen Charlton

Address Symetic

Occupation

3. Details of the accident (Continue on the back of this form if you need to)

When it happened Date 14.3.19 Time 8.10am

Where it happened, Site/location pool area.

How did the accident happen? Lesley slipped going from the pool into the Spa She Stops Back to look at the Clock on the Wall to See what time it was She loosses her Balance, falls Back and Twist her legs legs on the Fall,

If the person who had the accident suffered an injury, give details She Could Not Move her leg, I had to Call Ambulance as She was in So much pain

4. Sign and date

Person filling in this record

Print Name Karen Charlton Sign K Charlton Date 14.3.19

Person who has had the accident (for confirmation they agree the accident has been recorded accurately)

Print Name Sign Date

5. For the employer only

Complete this box if the accident is reportable under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)

How was it reported?

Print Name Sign Date

Accident Records and Investigation Reports

The accident investigation does a lot more than providing basic details.

Be aware of the content and make sure that the details do not compromise your company / client.

Some companies use the term "without prejudice" which restricts the document from being disclosed or used as evidence

ACCIDENT INVESTIGATION REPORT

RIDDOR F2508 Notification Number: Not submitted (awaiting further information)
Injured Person: CB **Date of Accident:** 11.01.2 **Time:** 06.40am
Staff / Member/Other status: Member
Place of Incident: Main Gym area
Equipment Involved: Lat Pull Down
Details of Injury: Impact injury to Head
Estimated Absence: Up to 3 days

Investigation carried out by: GK

Details of Incident / Investigation Interview

Introduction
The purpose of the accident investigation is to determine the cause, to establish facts and to use the information to prevent a similar recurrence by reviewing existing control measures and recommending appropriate actions.

The Injured Person (IP) – Mr CB prepared a letter of his interpretation of events as he understood and remembered the sequence of events. See attached letter.

Reporting of Injuries, Diseases, Dangerous Occurrences Regs 2013 (RIDDOR)

RIDDOR puts duties on employers, the self-employed and people in control of work premises (the Responsible Person) to report certain serious workplace accidents, occupational diseases and specified dangerous occurrences (near misses).

In relation to RIDDOR, an accident is a separate, identifiable, unintended incident, which causes physical injury. This specifically includes acts of non-consensual violence to people at work

RIDDOR Cont'd …

- RIDDOR only requires you to report accidents if they happen 'out of or in connection with work'. The fact that there is an accident at work premises does not, in itself, mean that the accident is work-related – the work activity itself must contribute to the accident. An accident is 'work-related' if any of the following played a significant role:

  - the way the work was carried out
  - any machinery, plant, substances or equipment used for the work or
  - the condition of the site or premises where the accident happened

What are ‘reportable’ injuries?

- **The death of any person** (Regulation 6)
- **Specified Injuries** to workers (Regulation 4)
- Injuries to workers which result in their **incapacitation for more than 7 days** (Regulation 4)
- Injuries to non-workers which result in them **being taken directly to hospital for treatment**, or specified injuries to non-workers which occur on hospital premises. (Regulation 5)

Specified injuries to workers

The list of ‘specified injuries’ in RIDDOR 2013 replaces the previous list of ‘major injuries’ in RIDDOR 1995. Specified injuries are (regulation 4):

- fractures, other than to fingers, thumbs and toes
- amputations
- any injury likely to lead to permanent loss of sight or reduction in sight
- any crush injury to the head or torso causing damage to the brain or internal organs
- serious burns (including scalding) which:
  - covers more than 10% of the body
  - causes significant damage to the eyes, respiratory system or other vital organs

Specified Injuries Cont'd …

- any scalping requiring hospital treatment
- any loss of consciousness caused by head injury or asphyxia
- any other injury arising from working in an enclosed space which:
  - leads to hypothermia or heat-induced illness
  - requires resuscitation or admittance to hospital for more than 24 hours

Over-seven-day incapacitation of a worker

- Accidents must be reported where they result in an employee or self-employed person being away from work, or unable to perform their normal work duties, for more than seven consecutive days as the result of their injury.
- This seven day period does not include the day of the accident, but does include weekends and rest days. The report must be made within 15 days of the accident.

Over-three-day incapacitation

- **Accidents must be recorded, but not reported where they result in a** worker being incapacitated **for more than three consecutive days**. If you are an employer, who must keep an accident book under the Social Security (Claims and Payments) Regulations 1979, that record will be enough.

Non fatal accidents to non-workers (eg members of the public)

- Accidents to members of the public or others who are not at work must be reported if they result in an injury and the person is taken directly from the scene of the accident to hospital for treatment to that injury. Examinations and diagnostic tests do not constitute ‘treatment’ in such circumstances.

- **There is no need to report incidents where people are taken to hospital purely as a precaution when no injury is apparent.**

- If the accident occurred at a hospital, the report only needs to be made if the injury is a ‘specified injury’

Occupational diseases

Employers and self-employed people must report diagnoses of certain occupational diseases, where these are likely to have been caused or made worse by their work: These diseases include (regulations 8 and 9):

- carpal tunnel syndrome;
- severe cramp of the hand or forearm;
- occupational dermatitis;
- hand-arm vibration syndrome;
- occupational asthma;
- tendonitis or tenosynovitis of the hand or forearm;
- any occupational cancer;
- any disease attributed to an occupational exposure to a biological agent.

Dangerous Occurrences

Dangerous occurrences are certain, specified near-miss events. Not all such events require reporting. There are 27 categories of dangerous occurrences that are relevant to most workplaces, for example:

- the collapse, overturning or failure of load-bearing parts of lifts and lifting equipment;
- plant or equipment coming into contact with overhead power lines;
- the accidental release of any substance which could cause injury to any person.

Gas incidents

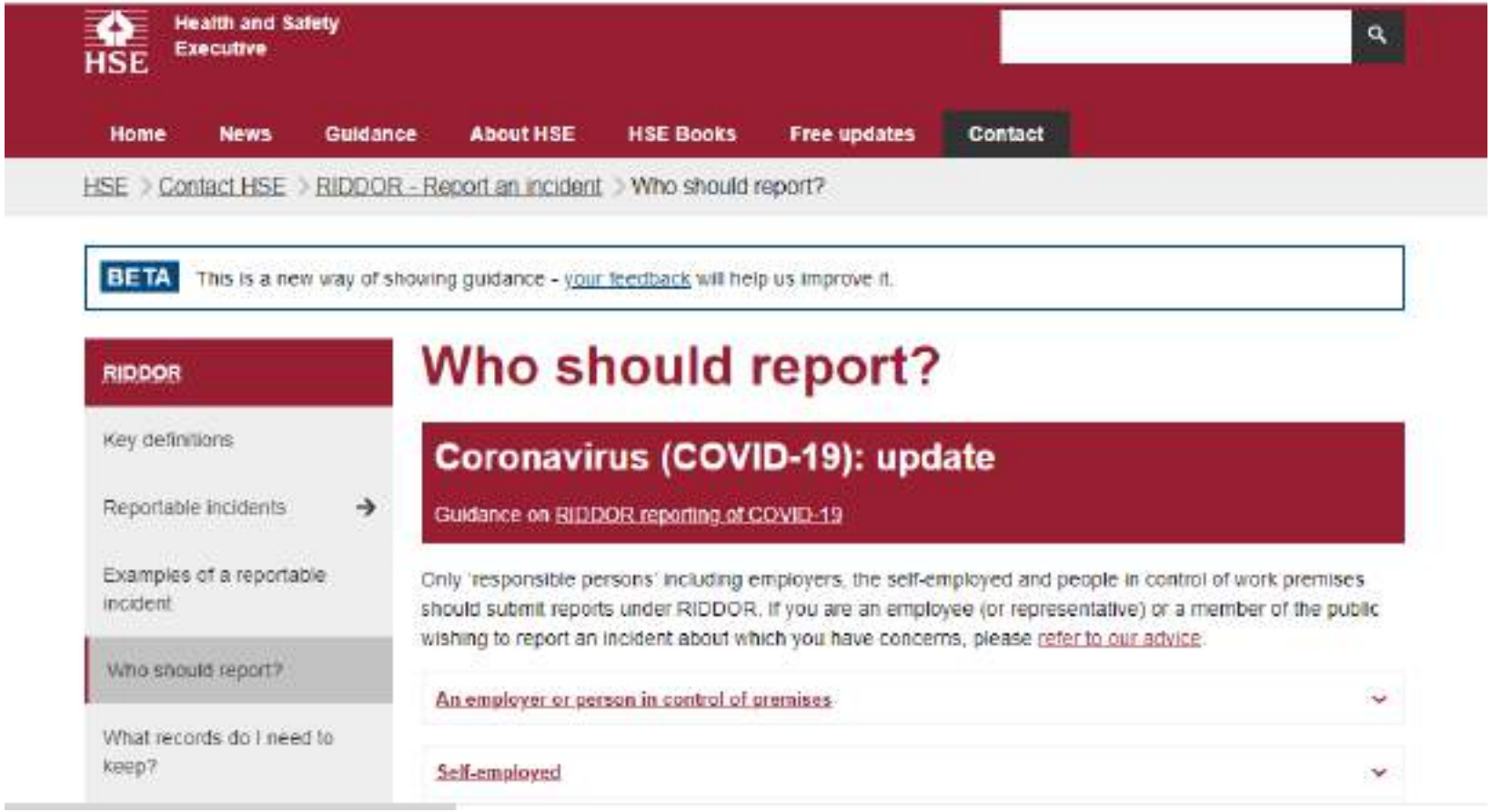
- Distributors, fillers, importers & suppliers of flammable gas must report incidents where someone has died, lost consciousness, or been taken to hospital for treatment to an injury arising in connection with that gas.
- Registered gas engineers (under the Gas Safe Register,) must provide details of any gas appliances or fittings that they consider to be dangerous, to such an extent that people could die, lose consciousness or require hospital treatment.

How to make a RIDDOR report

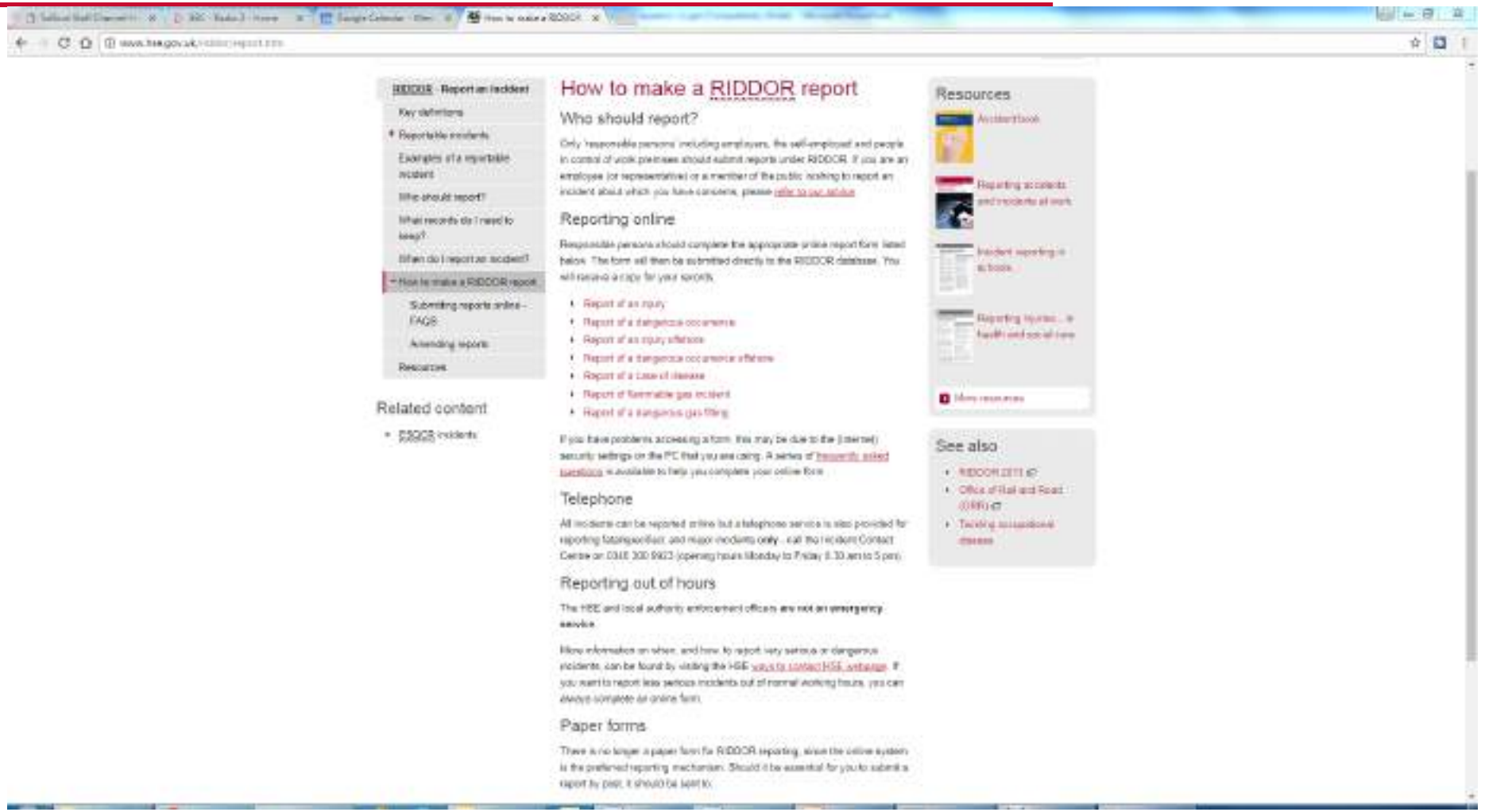
Responsible persons should complete the appropriate online report form listed on the HSE website. The form will then be submitted directly to the RIDDOR database. You will receive a copy for your records.

All incidents can be reported online but a telephone service is also provided for reporting fatal/specified, and major incidents **only**.

HES's RIDDOR website



https://www.hse.gov.uk/riddor/



RIDDOR - Report an incident

Key definitions

Reportable incidents

Examples of a reportable incident

Who should report?

What records do I need to keep?

When do I report an accident?

How to make a RIDDOR report

Submitting reports online - FAQS

Amending reports

Resources

Related content

RIDDOR incidents

How to make a RIDDOR report

Who should report?

Only 'responsible persons' including employers, the self-employed and people in control of work premises should submit reports under RIDDOR. If you are an employee (or representative) or a member of the public wishing to report an incident about which you have concerns, please refer to our advice

Reporting online

Responsible persons should complete the appropriate online report form listed below. The form will then be submitted directly to the RIDDOR database. You will receive a copy for your records.

- Report of an injury
- Report of a dangerous occurrence
- Report of an injury offshore
- Report of a dangerous occurrence offshore
- Report of a case of disease
- Report of flammable gas incident
- Report of a dangerous gas fitting

If you have problems accessing a form, this may be due to the (internet) security settings on the PC that you are using. A series of frequently asked questions is available to help you complete your online form.

Telephone

All incidents can be reported online but a telephone service is also provided for reporting fatal/specified and major incidents only - call the Incident Contact Centre on 0345 300 9923 (opening hours Monday to Friday 8.30 am to 5 pm).

Reporting out of hours

The HSE and local authority enforcement officers **are not an emergency service**.

More information on when, and how, to report very serious or dangerous incidents, can be found by visiting the HSE ways to contact HSE webpage. If you want to report less serious incidents out of normal working hours, you can always complete an online form.

Paper forms

There is no longer a paper form for RIDDOR reporting, since the online system is the preferred reporting mechanism. Should it be essential for you to submit a report by post, it should be sent to:

Resources

Accident book

Reporting accidents and incidents at work

Incident reporting in schools

Reporting injuries... in health and social care

More resources

See also

RIDDOR 2013

Office of Rail and Road (ORR)

Tackling occupational disease

Case Study:

Large, warehouse-type DIY store.

Fork Lift Truck (FLT) driven around a blind bend into an aisle and hit a customer causing serious, but not life threatening, injuries.

In trying to avoid the customer, the FLT driver turned the vehicle over and sustained significant injuries, including a punctured lung.

An ambulance was called, treated the casualties at the scene and took both to hospital for treatment. Both stayed in for several days.

Management viewed CCTV footage and found that the driver was going too fast and working in a prohibited area. They planned to implement disciplinary procedures against him that could result in dismissal.

The Health and Safety Inspector is coming to inspect. Management feel confident.

- Should they be?
- Who is at fault?
- What other factors could have influenced the accident?
- Does fault lie with the driver and, if so, is it total or contributory.

To summarise:

Accidents … do not arise from single causes. They occur through the unforeseen … series of actions of several distinct factors, each one necessary but singly insufficient to cause the catastrophic breakdown..

Deepwater Horizon Incident

https://www.channel5.com/show/inferno-at-sea-the-deepwater-disaster

Reason's Model as applied to the Deepwater Horizon Incident

University of Salford MANCHESTER
1967 - 2017 50 YEARS