

Loss causation and incident investigation

Loss making events (injuries resulting from accidents in our case) have various causes which can be placed into two groups :-


Immediate Causes

The cut was caused by a sharp edge on the workpiece, the back strain was caused by lifting a box that was too heavy. This is often as far as a production manager or a line manager will investigate and hopefully the operator will remember to wear gloves or get a hand lifting the box next time but these immediate causes have underlying causes which should be investigated in order to get to the root causes of a loss making event.

Underlying Causes


The sharp edge on the workpiece shows a failure of the manufacturing process, to remove sharp edges, the operator didn't know that they should wear gloves, the operator didn't have gloves and didn't know where to get them, the gloves supplied were not up to the task, the operator knew that gloves were needed but was in too much of a hurry to get a pair or to put them on... you get the idea I'm sure. If we fix an immediate cause (e.g. removing the sharp edge) then no one else will be injured by that edge on that workpiece, but will there be a sharp edge on the next workpiece and more injuries ? If we fix the underlying causes of an accident then we prevent that type of accident happening again and so benefit from fewer investigations to do in the future, as well as all the other benefits of good health and safety management.

A long time ago a man by the name of Heinrich published his domino theory about what causes accidents. Things were different back then and it was OK to say things like “ oh it's their culture you know”. Heinrich thought in straight lines and was a bit blinkered in his approach so there are only five logically ordered steps in his model of how loss events happen :-

Ancestry / Social Environment	Fault of Person	Unsafe Act / Unsafe Condition	Accident	Injury
This is very “un-PC” but Heinrich believed that character traits such as stubbornness, recklessness, etc could be passed down genetically (Ancestry) and socially. He also believed that lack of education (Environmental) might also lead to these traits (which is a bit more PC)	Fits of Anger, Reckless Behaviour, Nervousness, Excitability	Knowingly taking risks, Refusing to take precautions, Removing guards, Not maintaining housekeeping standard, etc	Cutting, Crushing, Tripping, Slipping, Falling off ladders, etc	Fractures, Cuts, Bruises, Broken Bones, Death
				

If you can prevent one of the steps from happening then that stops the whole process, the easiest one to stop is the unsafe act or mechanical/physical hazard although there is some focus now being placed on environmental causes through education and advertising awareness campaigns.

A little later on Bird and Loftus developed Heinrich's theory and brought out their own theory of why loss making events occur and how to prevent them. This was still quite simplistic in that it was still one straight line, however it did include management failures as steps in the process to a loss making event, and this was a revelation. This is the basis of loss control management and can be applied in every case.

Management Failure to Control	Basic Causes (Personal and Job Factors)	Substandard Conditions, Errors	Accidents	Injuries
Putting production before safety, failing to assess risks properly, failure to implement control measures, poor H&S culture	Untrained employees, routine violations (lack of discipline), uncorrected errors, etc	Knowingly taking risks, Refusing to take precautions, Removing guards, Poor housekeeping standard, etc	Cutting, Crushing, Tripping, Slipping, Falling off ladders, etc	Fractures, Cuts, Bruises, Broken Bones, Death
				

Following on from this came multi causality theory, where it was recognised that one loss making event could have several root causes which, when they come together, result in a loss making event. For instance in order for a fire to occur several things need to happen at once.

1. Fuel has to be present
2. Oxygen has to be present
3. The fuel and oxygen have to be in the correct proportions to ignite
4. A source of ignition has to be present.

If any of these things are not true, the fire shall not happen. So in order to investigate a fire we have to check for all sources of ignition, all sources of fuel, and all sources of oxygen (although it is usually present in the atmosphere).

A multiple cause investigation results in a diagram similar to that used for Fault Tree Analysis and each possible cause must be analysed to find root causes.

At this point you should read HSG245 which goes into great detail about accident investigation and provides several examples.