NEBOSH Health and Safety Management for Construction (UK)

May 2022 - Supplement

Contents

1 Element 1: The foundations of construction health and safety management

Learning Outcome (related content 1.2-1.7)

The learner will be able to: Advise on the main roles, competencies and duties under construction legislation and on a range of general construction site issues.

1.2 Identify how technology can be used to effectively plan and manage construction project lifecycles.

INTRODUCTION TO BUSINESS INFORMATION MODELLING (BIM)

BIM is a process for creating and managing information on a construction project throughout its whole life cycle. As part of this process, a coordinated digital description of every aspect of the built asset is developed, using appropriate technology. It is likely that this digital description includes a combination of information-rich 3D models and associated structured data such as product, execution and handover information.

BIM provides a digitised record of information about every component of a building in one place, enabling everyone involved to view updated and accurate information at key stages of a project, including when a building is occupied.

BIM has been recommended by Dame Judith Hackitt (former chair of the HSE) as an effective way of incorporating building safety into the design and construction from the outset, as well as enabling an evidence base to support safety while a building is occupied. BIM can therefore support the construction, handover and management of safer, higher quality buildings.

In the early stages of a BIM project, a collaborative team is assembled. It agrees the process and information structures to ensure that the design information developed is coordinated, and will be of maximum benefit to those involved in the construction and operation stages. Involvement of those that will be involved at a later stage of the project (such as manufacturers or the client's Facilities Management team) can greatly help with this initiation.

As the project enters the construction stage, the information developed can be used to plan and build more efficiently. Where revisions to the design are required, any changes can follow the agreed process in a transparent and recorded way.

Finally, as the construction project is completed and the in-use stage commences, the information that has been modelled can be used to operate the built asset. Real-time information about the asset's performance is modelled so that certain aspects of the built asset have a 'digital twin' equivalent.

BIM STANDARDS

There are a number of standards that define BIM information structures and processes internationally.

Information structures:

- ISO 16739-1:2018 – 'Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries — Part 1: Data schema'.
- ISO 12006-2:2015 – 'Building construction - Organization of information about construction works - Part 2: Framework for classification'. The UK National Foreword of this standard lists Uniclass 2015 as the classification system for UK BIM.

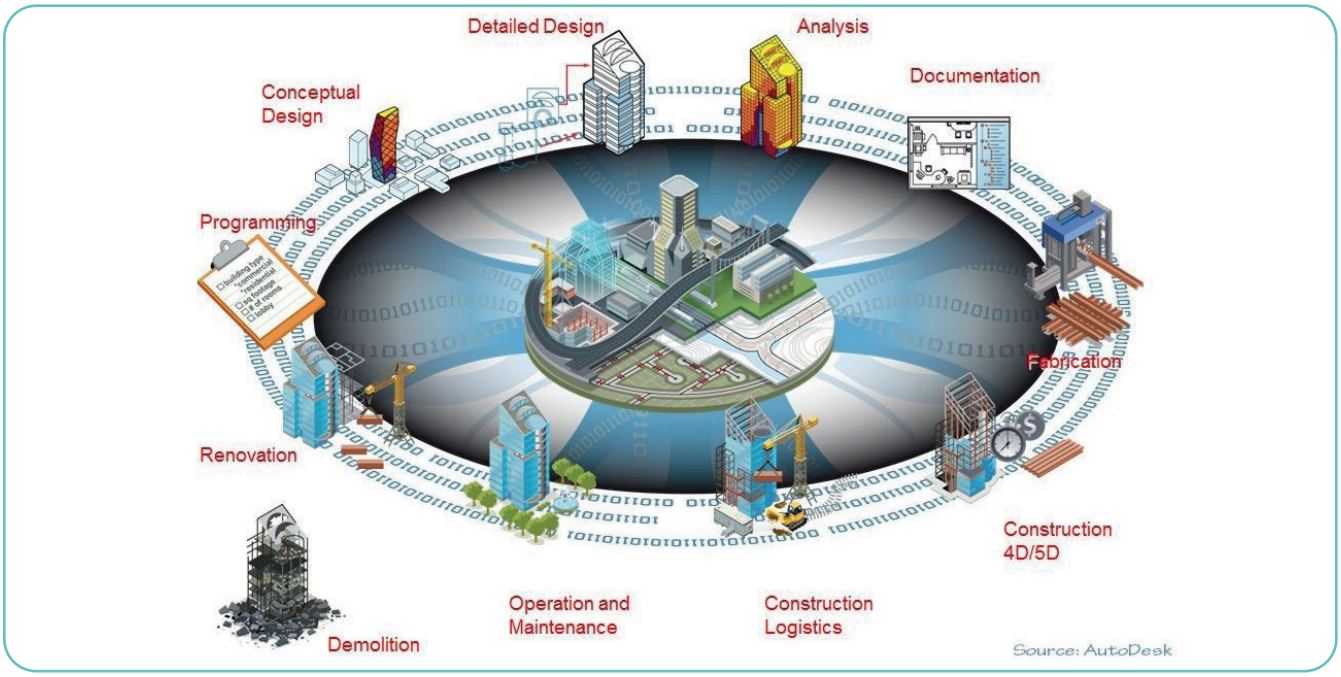

Figure 1-1: BIM Process.
Source: Autodesk

- ISO 23386:2020 – 'Building information modelling and other digital processes used in construction — Methodology to describe, author and maintain properties in interconnected data dictionaries. At NBS, we follow this framework when modelling information structures with manufacturers in the NBS Source platform.

Processes:

- UK BIM Framework – the ISO 19650 series of standards defines the BIM process internationally. These had their basis in the UK PAS 1192 series of standards. The UK BIM Framework website has further information on these standards, and extensive free-to-use guidance resources.

BIM DIMENSIONS

BIM dimensions have evolved from a need to differentiate between modelling geometry in two dimensions or three dimensions. This has been part of the modelling evolution, moving from drawing boards to the first 2D CAD systems, to 3D modelling packages.

Adding further aspects to this modelling can help project teams understand what information they are setting out to model. 4D is commonly known as 'modelling scheduling information to model construction sequences. 5D is known as 'adding financial cost'. There is little international consensus beyond this, and arguably cost isn't a 'dimension' at all – it is just a further information field.

In the international standards, these dimensions are not typically referred to. If specific information is required to be modelled, it is far better to be clear on precisely what this information is than to use terminology such as 5D, 6D or 7D, etc.

BIM OBJECT

A BIM object is a combination of many things. It is detailed information that defines the product, and geometry that represents the product's physical characteristics. The visualization data that gives the object a recognizable appearance and behavioural data, such as detection zones, enables the object to be positioned or to behave in exactly the same way as the product itself. There are two primary types of objects: component and layered.

- The component objects are building products that have fixed geometrical shapes (such as windows, doors, boilers, etc.).
- Layered objects are building products that do not have a fixed shape or size (such as carpets, roofing, walls and ceilings).

Figure 1-2: 3D Modelling
Source: Cadnetics.com

SPECIFICATIONS AND THE BIM PROCESS

Specifications are a huge part of the BIM process. Each discipline involved in designing the built asset needs to specify their requirements. Throughout the project timeline, this specification information should develop from a description of the required performance outcome through to a prescriptive solution of systems and products that meet this performance. Finally, these specifications should be updated throughout the construction phase so that the client may receive a set of record specifications at handover.

This information should be authored to a standard structure and coordinated with the information in any 3D models, and in related databases.

FUTURE OF BIM

The leading edge of the industry will continue to innovate. Various surveys show that cloud computing, the Internet of Things, Blockchain, artificial intelligence and modern methods of construction are all on the rise.

However, for the majority of the industry, the future is about making the existing information structures and processes 'business as usual'. These are mainly training, education and cultural challenges. But technology can also help. As platforms mature, the manual tasks of structuring data, classifying data and naming files will be automated. This will enforce the structure and the process, and help accelerate BIM.

In the future, there will be a golden thread of information that is collaboratively developed in parallel to the design and construction of built assets. This will be a record of what has been built, developing a record of how the asset is performing. Across client estate – or even national – boundaries, this will in time be the 'big data' that helps decision makers continuously improve to build a safer and more sustainable built environment.

BENEFITS OF BUILDING INFORMATION MODELLING

- Enhanced communication and teamwork

BIM ensures better teamwork, management, and sectioning sets of drawings that are usually difficult to understand through paper drawings. BIM allows uninterrupted interfacing with all the project areas. BIM facilitates better project work distribution among the members involved and project planning management that makes it easier for the project stakeholders to understand.

- Cost assessment

BIM provides the construction cost estimates before the beginning of the construction phase. Tools like BIM 360 Docs can be used to estimate costs that are related to materials and their shipping, shipping of prefabricated or modular pieces, and labour. BIM modelling can help in choosing more cost-effective materials, streamline the workflow of the construction, purchase the materials at their lowest market price and reduce human errors which lead to delays in the project.

- Monitoring changes

Construction project undergo several modifications before the construction is carried out on the field. BIM makes it easier to monitor these modifications to return to an earlier design of the model if the new one is erroneous. This feature helps the project designers save time compared to the 2D drawings since there is no requirement of redrawing the designs again.

- Visualisation of the project

BIM offers tools that help in proper planning and clear visualization before the initiation of the construction work. 3D visualization and the simulation of the surface area help the client to get the post-construction visualization of the infrastructure thus facilitating easy modifications prior to the construction stage.

- Effective coordination

BIM provides easy and effective coordination among the various teams involved. It detects all the internal and external clashes and conflicts between any field. Software like Autodesk BIM 360 glue can be employed to prevent clashes through automated clash detection. Clash detection limits the number of repairs or reconstruction required.

- Lowered risks and expenses

BIM helps in lowering expenses. Good coordination with the contractors can reduce the cost of insurance, lower the number of generic versions and reduce the risk of claims. Reviewing the project at its preconstruction stage can reduce the number of unused material wastes. Most of the firms employ construction technology and BIM to reduce the overall risks and expenses.

- Sequence and schedule

BIM technology helps save time by reducing the lifespan of the project cycle and avoiding any delays in the scheduling of the construction. It enables precise planning and improves collaboration which increases the chance of the completion of the project within the stipulated time.

3 Element 3: Managing change and procedures

Learning Outcome (related content 3.6)

The learner will be able to: Measure and monitor health and safety performance data.

3.6 Explain how to obtain, analyse and report health and safety performance data, including the benefits and limitations of this approach.

HEALTH AND SAFETY PERFORMANCE DATA

Organisations need to monitor their health and safety performance objectives to assess how effective they are, in the same way that they would measure finance, production, service or sales objectives. Similarly, audits can be used to monitor the organisation's policy, organisation and arrangements to determine the extent that they have been implemented and the degree to which they are effective in managing health and safety risks. It is essential for organisations to learn from their experiences and take the opportunity to decide how to improve performance.

The Management of Health and Safety at Work Regulations (MHSWR) 1999 Regulation 5 requires employers to make arrangements for the effective monitoring of preventive and protective measures.

Monitoring therefore provides the opportunity and information to enable management to:

- Assess the suitability and effectiveness of health and safety management system, including control measures.
- Make recommendations for improvements.

A successful management system will include requirements for regular monitoring activities and the consideration of the results of monitoring in order to ensure the organisation achieves ongoing health and safety success. Some monitoring activities may be conducted by people external to the organisation in order to provide the organisation with an independent perspective on health and safety performance, for example by conducting independent audits.

DIFFERENCES BETWEEN ACTIVE AND REACTIVE MONITORING

An effective approach to the management of health and safety risks seeks to learn from all available monitoring sources. Therefore, there is a need for an organisation to use a range of both active and reactive monitoring to determine whether objectives have been met and are effective. The differences between these two categories of monitoring are:

1) Active monitoring (before the incident) involves identification through regular, planned observations of workplace conditions, systems, and the actions of people, to ensure that performance standards are being implemented and management controls are working, for example, workplace and plant inspections

2) Reactive monitoring (after the incident) involves learning from mistakes, whether they result in injuries, illness, property damage or near-misses - for example, accident/incident investigation.

Both monitoring methods require an understanding of the immediate and the underlying causes of accidents/incidents and ill health. Organisations need to ensure that information from both active and reactive monitoring is used to identify situations that create risks, and to do something about them. Priority should be given where risks are greatest.

ACTIVE AND REACTIVE MONITORING METHODS AND THEIR USEFULNESS

Active

Objectives and usefulness of active monitoring

The primary objectives of active monitoring are to:

- Check that health and safety objectives, plans and arrangements have been implemented.
- Monitor the extent of compliance with the organisation's arrangements/procedures, and with its legislative/technical standards.

Active monitoring will tell the organisation about the reliability and effectiveness of its policy, objectives, arrangements, and procedures, before their limitations are made obvious through accidents/incidents or ill health. This provides a good basis from which decisions and recommendations for maintenance and improvement may be made.

Active monitoring provides an opportunity for management to confirm commitment to health and safety objectives.

It also reinforces a positive health and safety culture by recognising success and positive actions, instead of 'punishing' failure after an undesired event.

Health and safety performance in organisations that manage health and safety effectively is measured against established standards. This enables confirmation of compliance with standards and where improvement is required. By establishing standards of expectation, it enables deficiencies to be quickly translated into improvement actions. Organisations should make active monitoring an integral and normal part of the management function. As such it must take place at all levels and at all opportunities in the organisation's operation.

Managers should be given responsibility for the monitoring of objectives and compliance with performance standards for which they and their subordinates are responsible. The actual method of monitoring will depend on the situation and the position held by the person monitoring.

The success of action to manage risks is assessed through active monitoring involving a range of techniques. This includes techniques which examine technical measures (equipment, premises, and substances), procedural measures (systems of work, method statements, safety cases, and permits-to-work), and behavioural measures (motivation, attitudes, and competencies).

Active monitoring methods

Various active monitoring methods are used by organisations to measure health and safety performance, including:

- Systematic inspection of premises, plant, and equipment by supervisors, maintenance department, line management and health and safety representatives to ensure the continued effective operation of workplace precautions.
- Routine and random sampling of workplace conditions by supervisors, nominated workers and health and safety professionals.
- Senior management tours of departments, locations and work activities.
- Consideration of regular reports on health and safety performance by the board of directors.
- Routine procedures to monitor specific objectives, for example, quarterly or monthly reports or returns.
- Periodic examination of documents to check that systems relating to the promotion of the health and safety culture are complied with, for example, the way objectives for managers are established or appraised, assessment of records of training needs and delivery of training.

- Monitoring the workplace environment and health surveillance to check on the effectiveness of health control measures and to detect early signs of harm to health.
- Systematic direct observation of work and behaviour by first-line supervisors to assess compliance with risk control systems and associated procedures and rules.
- The operation of audit programmes.

The amount of effort organisations apply to active monitoring should be related to the level of risk, therefore monitoring of workplace precautions for hazards would typically be more detailed and frequent than management system activities that carry a low risk if they were not carried out as required.

Reactive

Objectives and usefulness of reactive monitoring

The objective of reactive monitoring is to measure the negative outcomes from the organisation's efforts to ensure health and safety, in order to identify the significance of these outcomes and opportunities for improvement. These negative outcomes are usually the result of undesired events or incidents. In order to carry out reactive monitoring effectively, systems must be in place to identify the incident, record it and report it. Without this, nothing may be learnt. Indeed, what little data that is communicated might serve to reinforce that there is no need to put in a great deal of health and safety effort. If reporting etc. is planned and encouraged, it is not uncommon to find a large increase in reported incidents. This does not necessarily mean an increase in incidents, merely an increase in reporting.

Information from these incidents contributes to the 'corporate memory' of the organisation, helping to prevent a repeat in another part of the organisation or at a later time. Though it should be remembered that the 'corporate memory' is said to be short, in the average organisation (one undergoing some change) it is likely to be in the order of four years. Data may also be gained from other organisations to reinforce or extend the organisation's experience of incidents and the hazards involved.

Distinction between different types of incidents

Incident

An incident can be defined as an unplanned, uncontrolled event that may result in injury, ill-health, dangerous occurrence, property damage or near-miss.

"Incident occurrence arising out of, or in the course of, work that could or does result in injury and ill health."

Figure 1-3: Definition of incident.
Source: ISO 45001:2018 Occupational health and safety management systems Requirements with guidance for use.

Injury

The term injury refers to physical harm to an individual, and incidents that result in this type of harm are called accidents.

Accidents (injury incidents) may be further categorised by the scale of injury experienced by the worker, for example, fatal injury, major injury, or injury requiring a set amount of absence from work or routine duties.

RIDDOR 2013 specifies the types of injury that it requires to be reported and recorded, see ***Reporting Requirements later in this document.***

Ill-health

The term ill-health refers to harm to a person's health caused by their work and will include harm to health in a physiological or psychological way. Ill-health of this type will relate to the wide range of occupational diseases that workers may experience, for example, asbestosis, pneumoconiosis silicosis and hand-arm vibration syndrome, many of which are listed in RIDDOR 2013 as notifiable diseases. Mental ill-health effects may relate to an excessive workload and include such things as stress. Some ill-health effects may take several years to develop and are commonly called ***chronic diseases***.

Dangerous Occurrence

A dangerous occurrence is an incident that does not result in injury but is significant enough to need to be reported to an enforcing authority. This term is used to describe significantly hazardous incidents specified in RIDDOR 2013, Schedule 2, such as the failure of any load-bearing part of a lift or hoist; collapse of a mobile powered access platform; overturning of a mobile crane or a significant collapse of a scaffold of five metres high or more.

Damage-only

Incidents at work cause substantial damage to equipment, property, and materials annually. The study of the incidence of damage-only losses may be a useful predictive tool to identify situations that might result in injury to people or other significant loss to an organisation. For example, a series of collisions into a scaffold, requiring minor repair by replacement of a scaffold tube, may be predictive of a later collision involving total scaffold collapse and major personal injury. Considering damage-only incidents can contribute greatly to the risk assessment process, indicating potential for major financial and human loss.

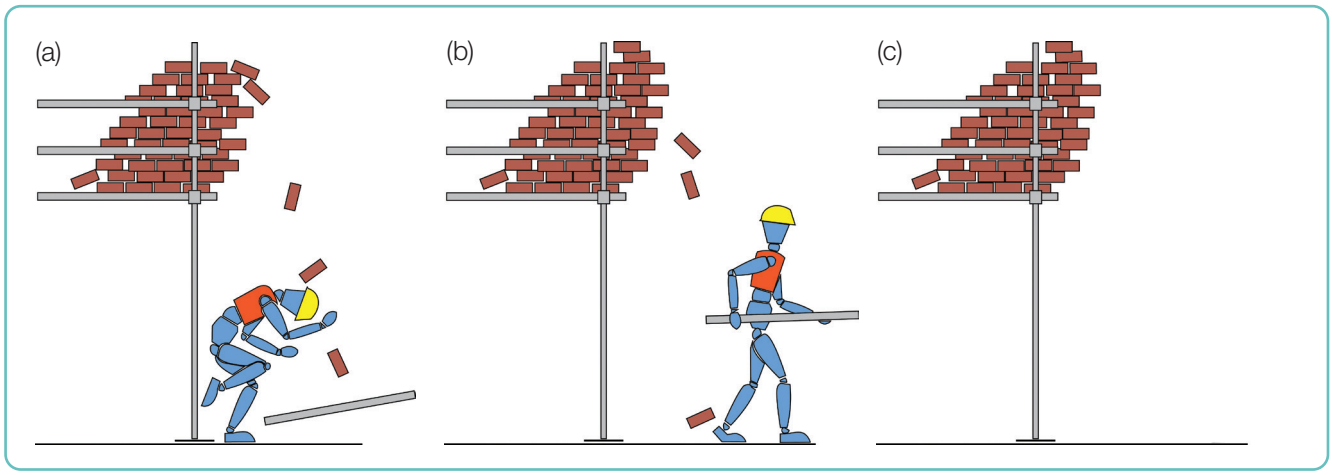

Figure 1-4: (a) Accident (b) Near-miss (c) Unsafe condition. Source: HSE, HSG245.

Near-miss

The term 'near-miss' refers to an event (incident) which did not result in personal injury, equipment damage or some other loss, but under slightly different circumstances could have done (for example, a building block falling off a scaffold and landing on the floor). The difference between a near-miss and a fatal accident in terms of time and distance can be very small. Apart from being unpleasant and perhaps very costly, every incident constitutes an opportunity to correct some problem.

For this purpose, a near-miss is just as valuable as an incident that results in serious injury/damage, in fact even more valuable in its role of providing preventative analysis as no one has been injured in learning that there is a problem.

The investigation of 'near-miss' incidents and the identification of their underlying causes might allow preventive action to be taken before something more serious occurs. It also gives the right message that all failures are taken seriously by the employer and not just those that lead to injury.

Figure 1-4 demonstrates the difference between an accident, near-miss and unsafe conditions.

Reactive monitoring methods

These methods are deemed to be after the incident and are therefore reactive monitoring measures:

- Identification.
- Reporting.
- Investigation.
- Collation of data and statistics, on the adverse events.

These reactive monitoring methods are nearly always limited to measurement of the extent of failure of health and safety management arrangements and procedures (if we ignore unforeseeable events which may affect the business, for example, severe weather, flooding, fire spread from a third party). For example, historical records to show:

- Accidents/incidents, for example, resulting in lost time, physical injury.
- Dangerous occurrences, for example, significant damage to plant, equipment or facilities.
- Near-misses, for example, accidents/incidents with no measurable loss.
- Ill-health, for example, resulting from exposure to substances or repetitive actions.
- Complaints by workforce, or contractors, for example, headaches, acne, blanched fingers.
- Worker absence statistics.
- Worker accident/incident and injury statistics compared with national averages for the same sector of employment
- The extent of lost profits arising from damaged goods, lost production time and reduced output following a health and safety failure.
- Enforcement action, for example, issue of verbal instructions or written notices by an enforcement agency.

It is important to identify, in each case, why performance was substandard. Trends and common features may be identified, such as when, where and how these events occur. This provides an opportunity to learn and put into place improvements to the overall management system and to specific risk controls.

THE DIFFERENCE BETWEEN LEADING AND LAGGING INDICATORS

When considering the management of performance of an organisation we often refer to "leading indicators" and "lagging indicators". Lagging indicators are typically

indicators of the outputs from the organisation and in the case of health and safety usually the outputs from its health and safety management system. These outputs can have a beneficial or adverse effect. For example, an output with a beneficial effect might be the reduction in the noise level in a workplace leading to reduced risk of noise induced deafness in workers and an output with an adverse effect might a new workplace layout leading to an increase in impact of moving vehicles with workers.

Leading indicators typically relate to the inputs that are made to the health and safety management system to achieve a given performance output and are the indicators that describe or measure this input. For example, in order to achieve a performance of a reduction in injuries from manual handling activities it may be decided to provide workers with manual handling training. A leading indicator would be the number of workers receiving manual handling training and a lagging indicator would be the quantity of manual handling injuries that occurred over a given period.

BENEFITS AND LIMITATIONS OF ANALYSING HEALTH AND SAFETY PERFORMANCE DATA, AND THE IMPACTS THAT STATISTICS CAN HAVE ON AN ORGANISATION

The benefits of measuring what goes right

Taking a systematic approach to management of health and safety makes managing an organisation's risks easier and can also make it more effective. Inevitably this will include learning from what goes wrong, but it is also important to manage health and safety proactively by measuring and learning from what goes right. In this way, it is possible to determine how health and safety risks have been effectively managed and transfer the good practice to other teams, departments and sites. Similarly, success in managing a specific risk could be identified and the practices used to manage that risk could be transferred to the management of other risks. This helps to establish a proactive learning culture, ensure efficiency and effectiveness, by avoiding the need for different parts of the organisation to find their own solutions and improvements.

If an organisation only measured negative outcomes and they had been lucky that no incidents had occurred in a period, any management/team meetings would have little to consider with regard to health and safety. This could seriously inhibit the organisation's effective management of risks. In addition, only focusing on the measurement of negative outcomes can become undesirable and demoralising to management and workers.

Determining what goes right provides an opportunity to reinforce the value of these good practices, which can provide opportunities for praise and motivation, making it more likely that those involved will continue to work in that successful way. In addition, the information gathered from measuring what goes right can be communicated to 'stakeholders' to reinforce the organisations proactive approach to health and safety. This would be of particular interest to:

- If workers see the organisation is actively looking after their health and safety, ***relations and morale*** will improve.
- The public see that the organisation is taking a responsible attitude towards health and safety, which provides a positive ***image*** and helps to generate a good ***reputation.***
- Insurers understand the organisation has a learning culture and is managing risk effectively. This may help ***lower your insurance premiums.***
- Banks and investors will be more willing to ***finance*** the organisation if it can show that it is well managed.
- Business partners have more ***confidence*** in the organisation. Larger organisations and government agencies might only buy from organisations that can show effective management systems.

The limitations of accident and ill-health data

If managing directors or chief executive were asked how they measured their organisation's performance, they would probably mention measures like percentage profit, return on investment or market share. A common feature of the measures quoted would be that they are generally positive in nature - reflecting achievement - rather than negative, reflecting failure. If the same people were asked how they measured their organisation's health and safety performance, it is likely that the only measure quoted would be injury and ill-health statistics. While the general business performance of an organisation is subject to a range of positive measures, for health and safety it too often comes down to one negative measure, injury, and ill health statistics - measures of failures.

Health and safety differs from many areas measured by managers because success results in the absence of an outcome (injuries or ill health) rather than a presence. But a low injury or ill-health rate, even over a period of years, is no guarantee that risks are being controlled and will not necessarily lead to low injuries or ill-health in the future. This is particularly true in organisations where there is a low probability of incident, but where major hazards are present. Here the historical record can be a deceptive indicator of health and safety performance.

Organisations need to recognise that there is no single reliable measure of health and safety performance. As organisations recognise the importance of managing

health and safety, they become aware of the problems with using injury and ill-health statistics alone as the only measure of health and safety performance. What is required is a 'basket' of measures or a 'balanced score-card', providing information on a range of health and safety performance, proactive measures of inputs and reactive measures of negative outcomes.

Some limitations of injury and ill health statistics:

- Reactive measurements – people must have been harmed to provide the statistics.
- Errors in data due to under-reporting - an emphasis on injury and ill-health rates as a measure, particularly when related to reward systems, can lead to such events not being reported in order to suggest good performance. Additionally, other factors may lead to under reporting, for example barriers in the reporting process, fear of blame, lack of interest of management.
- Comparability – some organisations use different multipliers to develop their rates and may have different definitions of what is a recordable injury or ill-health.
- Statistically representative – depending on how the statistics are derived the sample population from small organisations may be too small to provide representative data. In addition, statistics from two organisations with very different risk levels do not provide comparably representative data.
- Link between outcomes and risks - whether a particular event results in an injury is often a matter of chance, so it will not necessarily reflect whether or not a hazard is under control. An organisation can have a low injury rate because of luck or fewer people exposed, rather than good health and safety risk management.
- Number versus severity - injury frequency and incidence rates do not reflect the potential severity of incidents, merely the actual consequence. For example, the same failing to adequately guard a machine could result in a cut finger or an amputation.
- Motives for reporting and absence – workers could take absence from work for reasons which do not reflect the severity of the incident.
- Conclusions drawn - a low injury or ill-health rate can lead to complacency.

Many organisations spend considerable time developing data on their health and safety performance based on a variety of incidents, including accidents, dangerous occurrences, near-misses, and ill-health information. Whilst there is value in doing so it has the limitation of being after the incident. Incidents must occur to get the data, thus tending to influence effort to prevent a recurrence rather than action to prevent the event.

A low incident rate is not a guarantee that risks are being effectively controlled. In some cases, this might be a matter of good fortune, or the fact that incidents are not being reported, rather than effective management.

If organisations wait until an incident occurs to determine where health and safety effort is required, then some sort of loss will usually have occurred. In order to gain sufficient management attention this could be an incident resulting in personal injury to someone. Clearly this is an undesirable way of learning, particularly as, with an amount of effort, planning and thought, the incident could have been foreseen and prevented. The more mature organisation seeks to learn most from activities (for example, risk assessment) 'before the incident' or, at the very least, learn from those incidents that result in no personal injury, for example, near-misses.

Figure 1-5: Accident statistics
Source: RMS

The obvious use of incident data is to identify specific problem areas by recording instances where control measures have failed. However, analysis of the data allows general trends to be shown in order perhaps to identify common root causes, as well as comparisons to be made with others in order to learn from successes elsewhere. Incident data can also help to raise awareness in the minds of both managers and workers of health and safety in general, and of specific problems in particular. In addition, collection of data allows costs to be calculated, which can increase the likelihood of resources being allocated.

There are several methods of presenting incident data for analysis, some of the more common indices used are incidence and frequency rates. Methods of presenting data should not be mixed and figures for indices should only be used to compare like with like, for example, the same organisation over time or similar organisations using the same indices. The multipliers used in calculating the indices vary depending on whether the rates are derived at international, national or workplace organisation level. There is no formal structure as to what multi-

pliers should be used, but the main purpose of the multiplier is to bring the numbers to a manageable size.

Impacts that statistics can have on an organisation

Workplace accidents and ill-health must be viewed in perspective. The majority of people will go through their working lives without any injury or illness directly caused by the workplace. The data on the number of fatalities and injuries at work supports this. However, some people will go to work and be injured or suffer ill-health as a result, an even smaller number will be fatally injured at work.

Accident and Ill-health statistics derived from an organisation's activities can provide confirmation for some organisations that their control measures and management systems are effective and harm to workers and others is minimal. For those organisations that do not effectively manage their risks, accident and ill-health statistics can help to evidence that improvements are required and will indicate the type of accidents and ill-health that is occurring, providing focus for initial improvements.

Some organisations establish goals to improve their performance and reduce accidents and ill-health and use statistics on their accident and ill-health performance to drive improvements and to reduce harm. Where this is successful the statistics can help to confirm this improvement, where it has not been successful the statistics can indicate the need for more effort or different approaches to make an impact and secure the intended improvement, for example the introduction of behaviour focused programmes.

If an organisation's accident and ill-health statistics are able to be analysed it is possible to determine the effectiveness of initiatives to control specific risks, for example musculoskeletal injuries or injuries from contact with workplace transport.

Some organisations also seek to benchmark their performance with others and use accident and ill-health statistics to do this.

Many organisations are defined by their reputation. Their performance, measured in terms of accident and ill-health statistics, may have to be shared with stakeholders and clients. A poor performance could significantly affect an organisation's reputation and lead to stakeholders rescinding their stake in the organisation or clients withholding or cancelling contracts. When trying to win work it is an advantage if contractors can create a good reputation and show they can manage their health and safety risks successfully, accident and ill-health statistics can be provided to a client to confirm success.

Accident and ill-health statistics could also show an organisation as a good employer, which could assist with recruiting and retaining skilled and valuable workers.

INTERPRETATION OF RAW DATA: ACCIDENT/ INCIDENT FREQUENCY RATE, ACCIDENT INCIDENCE RATE, ACCIDENT SEVERITY RATE, ILL-HEALTH PREVALENCE RATE

Accident frequency rate

Frequency rate (accidents compared with time) =

$$\frac{\text{Number of accidents in the period}}{\text{Total hours worked during the period}} \times 1{,}000{,}000$$

This uses the '1,000,000' multiplier that the HSE and International Labour Office (ILO) use. In the UK, organisations frequently use multipliers of 100,000 or less, in order to bring the numbers to a manageable size, and the USA use 200,000. Care should be taken that the multiplier is specified when making comparisons.

Accident incidence rate

Incidence rate (accidents compared with number of people) =

$$\frac{\text{Number of accidents in the period}}{\text{Average number employed during this period}} \times 10{,}000$$

Accident severity rate

Severity rate (average number of days lost compared with hours worked) =

$$\frac{\text{Total no. of days lost}}{\text{Total no. of hours worked}} \times 1{,}000$$

Ill-health Prevalence rate

Prevalence rate (similar to incidence rate but is an index of ill-health rather than accidents) =

$$\frac{\text{Number of ill-health conditions observed over the period}}{\text{Number of people in the population exposed to agent over period}} \times 1{,}000$$

These calculations are made from the actual numbers of accidents, hours worked, numbers employed, and days lost. In order for the result to be a meaningful number, a large multiplier is included in the equation. The injury rates themselves only mean something if they are compared to other injury rates and are to be used to show trends. They may be compared to rates from previous years to rates from other departments in the company, to other companies or to rates in a particular industry.

The definition of all of these factors must be agreed in order to make comparisons. It is only meaningful to

compare like with like. For example, accident may mean any period of 'lost time' to some organisations, but to others a lost time accident is a 'RIDDOR reportable' accident which is greater than seven days.

The number of people employed in a given period may or may not include part-time workers and/or contractors, agency staff, other temporary workers. Calculating the hours worked may be inaccurate depending on where the figures come from. The finance department may give the paid hours rather than the actual hours. If workers get double time for overtime, this can skew the figures.

If a fatality occurs, it may not show up in the severity rate, as it will not be possible to say how many days have been lost. With the severity rate being low, it will appear that the accidents that have occurred have been minor.

If all rates are used together and compared with rates using the same definitions, they will be valid. If the rates rise, it does not necessarily mean that there has been no improvement. It could mean that the reporting procedures are better, and an improved health and safety culture means more people are willing to report. As with all statistical data, injury rates must be carefully analysed.

REPORTING ON HEALTH AND SAFETY PERFORMANCE

Under the Management of Health and Safety at Work Regulations 1999, as amended, employers must arrange for the effective monitoring and review of all preventive and protective measures implemented.

Public bodies in the UK are required to include a summary of their health and safety performance in their annual reports. There are also various global reporting standards, such as the Global Reporting Initiative (GRI), which include health and safety in their reporting criteria.

For some organisations, monitoring health and safety performance is limited to analysing accident and incident data to decide if they need to do anything differently. This basic monitoring is often done internally, at a local level, with little involvement from executives and directors.

With the Institution of Occupational Safety and Health (IOSH) and the Health and Safety Executive (HSE) making the case for health and safety to be embedded in wider business risk management, organisations should explore ways of making health and safety an important agenda for effective leadership in the board room. Reporting on health and safety performance in annual corporate reports is one way of ensuring board members set the direction for effective health and safety management and have the data to take strategic decisions where necessary.

Objectives and benefits of reporting health and safety performance

Many large organisations prepare comprehensive annual corporate reports which go beyond financial performance. Issues such as diversity and inclusion, environment and sustainability, and supply chain performance are often reported to external stakeholders. The EU Directive on non-financial reporting (Directive 2014/95/EU) requires certain organisations to disclose information on environmental and social issues. The associated guidance, although non-binding, suggests various health and safety issues for inclusion in reports.

In its joint guidance with the Institute of Directors ***INDG 417***, ***Leading Health and Safety at Work***, the HSE identifies monitoring, reporting, and reviewing performance as an essential leadership principle.

But despite the encouragement from various bodies to include health and safety in corporate reporting, a recent report by the Centre for Safety and Health Sustainability, ***The Need for Standardized Sustainability Reporting Practices: Issues Relating to Corporate Disclosure of Information on Occupational Health & Safety Performance*** (August 2017), concluded that voluntary reporting on health and safety lacks the degree of rigour necessary to allow key stakeholders to effectively evaluate corporate performance or compare performance across organisations.

Annual reports provide an opportunity for organisations to describe their risk profile and their performance in managing significant risks. Organisations can reap many benefits by including health and safety in its annual reports, including:

- Enhanced reputation as a transparent organisation.
- Stakeholder assurance that risks are being adequately managed.
- Benchmarking performance against other organisations the same or similar sectors.
- Continually improving health and safety performance and standards.
- Improved engagement among executives and directors and, consequently, improved leadership of health and safety.

What to report

When an organisation makes a commitment to include health and safety in its annual corporate reports, the task may seem daunting. Setting meaningful reporting criteria is arguably as important as the exercise of reporting itself. It is important to focus on the basics first and not jump straight into warts and all reporting, which may be counterproductive.

But it is important to be transparent. Being open about what went wrong in the previous 12 months is more credible than trying to hide it and only reporting on the positives.

Honest reporting provides an opportunity to benchmark performance year-on-year, and demonstrate commitment to continually improving.

Organisations who commit to reporting on health and safety should think about what to include in their first report. Initial criteria will often be limited to statistics, with some commentary to give context to the data. Statistics reported on might include:

- Accident, incident, and ill-health data, sub-divided into suitable categories such as fatalities, major injuries, and lost time events.
- Total days lost per 100 workers.
- A comparison of actual data against targets set at a national level, or by the organisation or industry sector.
- Extended accident-free periods in sectors such as construction where this type of measuring is commonplace.
- Enforcement and prosecution data, such as the number of statutory notices, fines or convictions received.
- The number of settled claims over a certain level in relation to work-related injury or ill health.

When reporting is in its infancy, it may not be necessary to provide detailed commentary on general health and safety performance, but this is something that should be on the horizon for future reporting. A commitment to enhancing reporting over the following 12 months makes a clear statement of intent and demonstration of board level buy-in.

Improve reporting

Organisations should not be content with just reporting on the basics. Reporting should evolve over time, providing a more in-depth overview of health and safety performance. One way to achieve this is to compile a detailed internal report on health and safety performance, with the longer-term aim of including this in external annual reports. Initial internal reporting on enhanced health and safety criteria gives organisations the opportunity to fine-tune their approach before sharing with external stakeholders.

At this stage, it is important to broaden the focus from the initial criteria outlined above. All those things should be included in the report, but there should be more detailed commentary on health and safety performance based on broader indicators. Such reporting should always be proportionate to the size of the organisation and its risk profile. There is no “one size fits all” solution, and organisations should avoid reporting on trivial issues.

Additional criteria reported here might include:

- An outline of board responsibilities for health and safety and a statement of commitment from a board member.
- Evidence of management commitment, such as executive participation in safety committees.
- The percentage of workers who have attended health and safety training.
- Scorecard data such as the number of risk assessments, audits and inspections completed versus target figures.
- The percentage of actions completed from risk assessments, audits, inspections and other monitoring activities.
- The number of emergency response drills held.
- An overview of the organisation’s significant risks, how they are being managed and what improvements are required.
- Progress against existing objectives and targets, along with objectives and targets for the coming 12 months.
- Arrangements for monitoring the performance of suppliers and contractors, including minimum standards and how they are measured.
- Awards and recognition for health and safety performance, or certifications achieved, such as iso 45001.

Enhanced reporting helps drive continual improvement and provides evidence of commitment to health and safety. Consulting with workers and seeking feedback on the content and format of the reports can help ensure future external reports are meaningful to all stakeholders.

Embedding health and safety in wider corporate reporting

Once an organisation has established protocols for reporting basic health and safety information and producing comprehensive internal reports, it can then focus on embedding health and safety in wider corporate reporting.

Many large organisations produce annual corporate social responsibility reports. Including health and safety in these reports demonstrates that health and safety is included in corporate governance processes, and that arrangements are in place to manage significant risks.

It is again important to be proportionate, and include meaningful and transparent information in external reports. For those organisations committed to health and safety, all the criteria discussed above should be included along with other criteria such as those outlined in the EU guidelines on non-financial reporting.

Public reporting of health and safety performance can provide a platform for organisations to improve how they manage health and safety, and demonstrate a commitment at board level. Organisations can benefit internally, for example by influencing long-term management strategy and policy; and externally, for example enabling external stakeholders to understand the risk profile and be assured that risks are being managed.

12 Element 12: Chemical and biological agents

Learning Outcome (related content 12.4)

THE PREVALENCE OF OCCUPATIONAL LUNG DISEASE AMONG CONSTRUCTION WORKERS

From 2018/2019 to 2020/2021 there were 74,000 workers suffering from work-related ill health (new or long-standing) averaged over the three-year period. The construction industry has the largest estimate of occupational cancer cases in the UK, with around 3500 occupational cancer deaths in a year caused by exposures in construction, according to a report by the HSE.

Construction workers are at high risk for lung cancer and other lung diseases, and should take proper care and precautions to keep healthy.

Figure 1-6: Cutting concrete block
Source: BNP Products

Inhaling toxic dust including harmful particles such as silica and asbestos has a profound impact on the lungs.

Although air quality is often regarded as less important than occupational safety, lung cancer mortalities are 50% higher among construction workers than the general population. Studies have found that nearly one-fifth of lung diseases among construction workers may be a result of harmful emissions on site. While some of these toxins are considered respiratory irritants, others are long-known carcinogens directly linked to lung cancer.

The nature of this industry is undoubtedly dangerous as it requires physical labour that not only raises the risk of accidental injuries but that of inhaling toxic dust onsite. Among this dust may be harmful particles such as silica and asbestos, which both have a profound impact on the lungs.

As of late, silica has been referred to as the "new asbestos" because of its prevalence throughout the building trade and its ability to cause silicosis, an incurable lung disease. Many construction workers are exposed to crystalline silica and over 800,000 workers exposed to levels beyond the recommended limit. Often a result of sawing or cutting concrete products, it has been found that these workers are twice as likely to develop chronic obstructive lung diseases like chronic bronchitis and emphysema.

Common power tools, including masonry saws and drills, can easily release fibres; however, the HSE provides approved methods for dust control onsite. Experts suggest using a face mask and wet saw, which will help weigh down the particles and prevent them from lifting and becoming airborne. Additionally, employers should establish a written exposure control plan, avoid sweeping or using compressed air, and offer routine medical exams for all workers. Extra caution is recommended on the job because breathing in crystalline silica can not only cause silicosis but chronic respiratory issues.

Asbestos also has a long-standing history within the construction industry and is a leading cause of occupational cancer around the world. Unlike silica, asbestos is not exclusively linked to one type of material but can be found in almost any building-related product manufactured before 1980. While it can still exist within cement, it's most widely known for its use in heat-resistant materials, floor and ceiling tiles, insulation, and pipe-wrapping.

Although this mineral has been regulated for several decades, toxic building materials still remain in older homes and buildings, along with construction sites themselves. Performing maintenance or repairs on asbestos-containing materials can result in microscopic airborne fibres that have proven deadly once inhaled. Symptoms can take as long as 40 years to show, which has historically led to workers being diagnosed in the advanced stages of mesothelioma. Construction workers are five times more likely to have cancer in the lining of the lungs and 33 times more likely to develop asbestosis.

PROACTIVELY RAISING AWARENESS OF THE RISKS TO REDUCE INCIDENTS OF OCCUPATIONAL LUNG DISEASE

Figures from the Health & Safety Executive (HSE) show that around 12,000 people died in the UK last year from lung diseases estimated to be linked to past exposure at work. Exposure to airborne dust is often considered to be an unavoidable part of working in the construction industry, and historically there has been a view in some parts of the industry that 'it's just dust' and doesn't represent a serious health risk. In reality, the facts are very different.

Construction dusts contain a mixture of individual contaminants, and often these have the potential to do serious, irreversible harm if exposures are not properly controlled. And because of the long latency of most lung diseases associated with these exposures, the true impact is often not fully appreciated.

This is compounded by the transient exposure patterns typically found in construction. The provision of long-term health surveillance is notoriously difficult in this industry, and many cases of ill health go un-reported and remain hidden. The true burden of respiratory disease in construction workers isn't accurately known, but estimates are that several hundred people die each year as a result of historic exposures to respirable crystalline silica. The issue is so big as to be the subject of a recent public inquiry, coordinated by the All-Party Parliamentary Group (APPG) on Respiratory Health.

A broad range of construction activities, for example:

- Cutting bricks, blocks, paving and kerbstones.
- Stonemasonry.
- Scabbling.
- Surface grinding.
- Tunnelling.
- Crushing.
- Screening demolition material.
- Clearing and removing rubble.
- Chasing out mortar before repointing.
- Laying epoxy floors and carpentry.

In addition, a broad range of substances used in construction activities are:

- Chemicals.
- Products containing chemicals.
- Fumes from welding, brazing and soldering.
- Dust e.g., Wood, cement, sand, plaster.
- Vapours from glues, solvents and paint thinners.
- Mists from spraying activities.
- Gases and asphyxiating gases.
- Biological agents.
- Germs that cause diseases.

These can create a risk of exposure to hazardous substances that can damage the lungs when breathed in and cause lung disease if not properly controlled.

In order to reduce the number of workers affected, an employer should conduct a risk assessment to monitor and ensure exposure doesn't rise above the workplace exposure limit (WEL). If exposure does exceed the WEL, specific warning signs are required in order to prevent workers from harmful exposure. Workers should never eat, drink, or smoke in contaminated areas, and employers should provide separate decontamination tents to allow workers to clean up before eating. All workers should be provided with such information, instruction and training, and workers should wear disposable clothes and respirators, wet down contaminated materials to avoid fibres from releasing, and keep the area well-ventilated.

Those working in a construction-related field should make sure that their doctor is aware of their occupation and consistently monitors their health for signs of occupational lung disease. Checks should be made for the following symptoms:

- Abnormal breathing patterns.
- Coughing.
- Wheezing.
- Chest pain or tightness.
- Shortness of breath.
- Dry or scratchy throat.
- Fever.
- Frequent chest infections.
- Hoarseness.
- Finger clubbing.
- Swollen face or neck.

Employers should not only recommend workers to wear personal protective equipment at all times but enforce its use. With many cancer deaths attributed to toxic inhalation in the workplace, it's extremely important to stay vigilant and follow proper safety practices.