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EDITORIAL

Dear Readers,

We are pleased to bring out the July-September 2020 issue of the Chronicle covering assorted ten articles contributed by eminent authors on most important contemporary issues.

Most of the businesses engage contractors, irrespective of the nature and size of business. Some large organizations hire contractors on a continuous basis and some on a daily basis for certain activities for which either they do not have necessary expertise and resources or when it is economical to get the job done by engaging contractors. However, simply hiring a contractor to carry out certain jobs does not absolve the principal employers from their obligations to provide a safe place of work. Two articles provided in this number, address the issues and challenges related to occupational health & safety in respect contractors in Indian industries.



Covid-19 outbreak has changed the approach towards workplace safety. Although, robust plant design, engineering controls, SOPs and OSH organization are essential, but they will be ineffective if behavioural safety aspects are not considered. To address some behavioural safety aspects in respect of Covid-19 issues a brief report on the study carried out by an expert has been published as an article titled “Critical Questions on COVID-19 and Management of Behavioural Safety Interventions: India Case Study” in this issue.

Interestingly, use of face mask has become the order of the day as a first line of defense against the Covid-19. Many people are not aware of the difference between the masks and respirators. The article on “Respiratory Protective Equipment – Differentiating the Respirators from Masks” included in this Chronicle, makes the understanding clear.

Sustainable development is a goal to be achieved by balancing the three pillars of sustainability, viz., Environmental, Social and Economic sub-systems. Societal expectations for sustainable development, transparency and accountability have evolved with increasingly stringent legislation, growing pressures on the environment from pollution, inefficient use of resources, improper waste management, climate change, degradation of ecosystems and loss of biodiversity. This has led organizations to adopt a systematic approach to environmental management by implementing ISO 14001 with the aim of contributing to the environmental pillar of sustainability. For benefit of readers, clauses wise explanation for Implementation of Environmental Management Systems ISO 14001:2015 has been provided in the issue. Also, published articles on process safety and holistic approach in occupational safety, health & hygiene.

It is hoped that the readers would find this issue interesting and useful one.

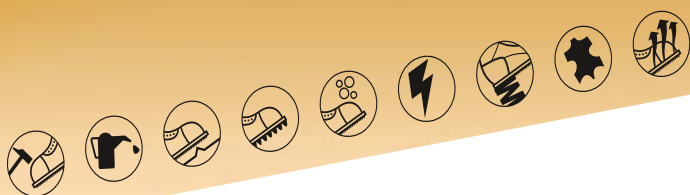
A handwritten signature in black ink, appearing to read 'Lalit'.

Lalit R. Gabhane
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CLAUSES EXPLANATION FOR IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT SYSTEMS ISO 14001: 2015

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1. Background

Sustainable development can be obtained by achieving a balance between the environment, society, and the economy, it is considered essential to meet the needs of the present without compromising the ability of future generations to meet their needs.

Sustainable development as a goal is achieved by balancing the three pillars of sustainability, viz., Environment, Social and Economic sub-systems. Societal expectations for sustainable development, transparency, and accountability have evolved with increasingly stringent legislation, growing pressures on the environment from pollution, inefficient use of resources, improper waste management, climate change, degradation of ecosystems, and loss of biodiversity.



Fig.1: Sustainable Development three pillars

This has led organizations to adopt a systematic approach to environmental management by implementing environmental management systems with the aim of contributing to the environmental pillar of sustainability.

2. Aim of ISO 14001:2015

- A systematic approach to environmental management.
- To build success over the long term and create options for contributing to sustainable development by:
 - Protecting the environment by preventing or mitigating adverse environmental impacts;

- Assisting the organization in the fulfillment of compliance obligations;
- Enhancing environmental performance, achieving financial and operational benefits
- Life Cycle Perspective: Controlling or influencing the way the organization's products, and services are designed, manufactured, distributed, consumed and disposed.

3. Plan-Do-Check-Act model

An environmental management system is founded on the concept of Plan-Do-Check-Act (PDCA). It can be applied to an environmental management system as a whole and to each of its individual elements. It can be briefly described as follows.

- Plan: Establish environmental objectives and processes necessary to deliver results following the organization's environmental policy.
- Do: implement the processes as planned.
- Check: monitor and measure processes against the environmental policy, including its commitments, environmental objectives and operating criteria, and report the results.
- Act: take actions to continually improve.

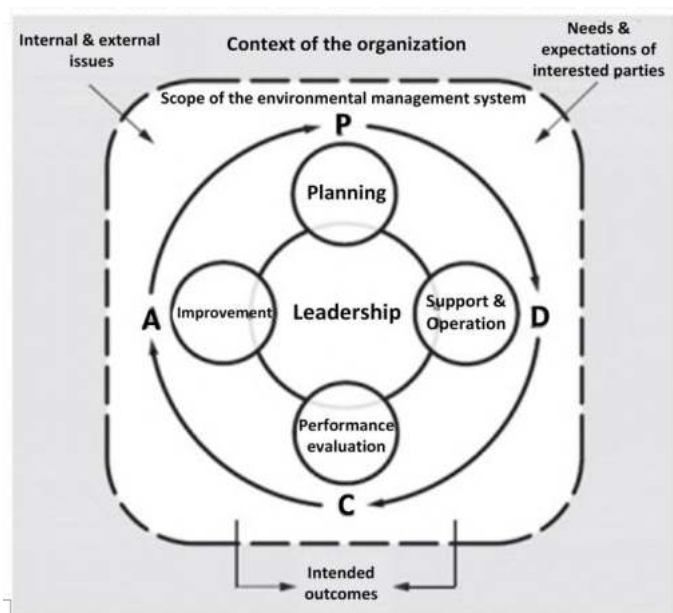


Fig. 2 — Relationship between PDCA and the framework in ISO 14001:2015

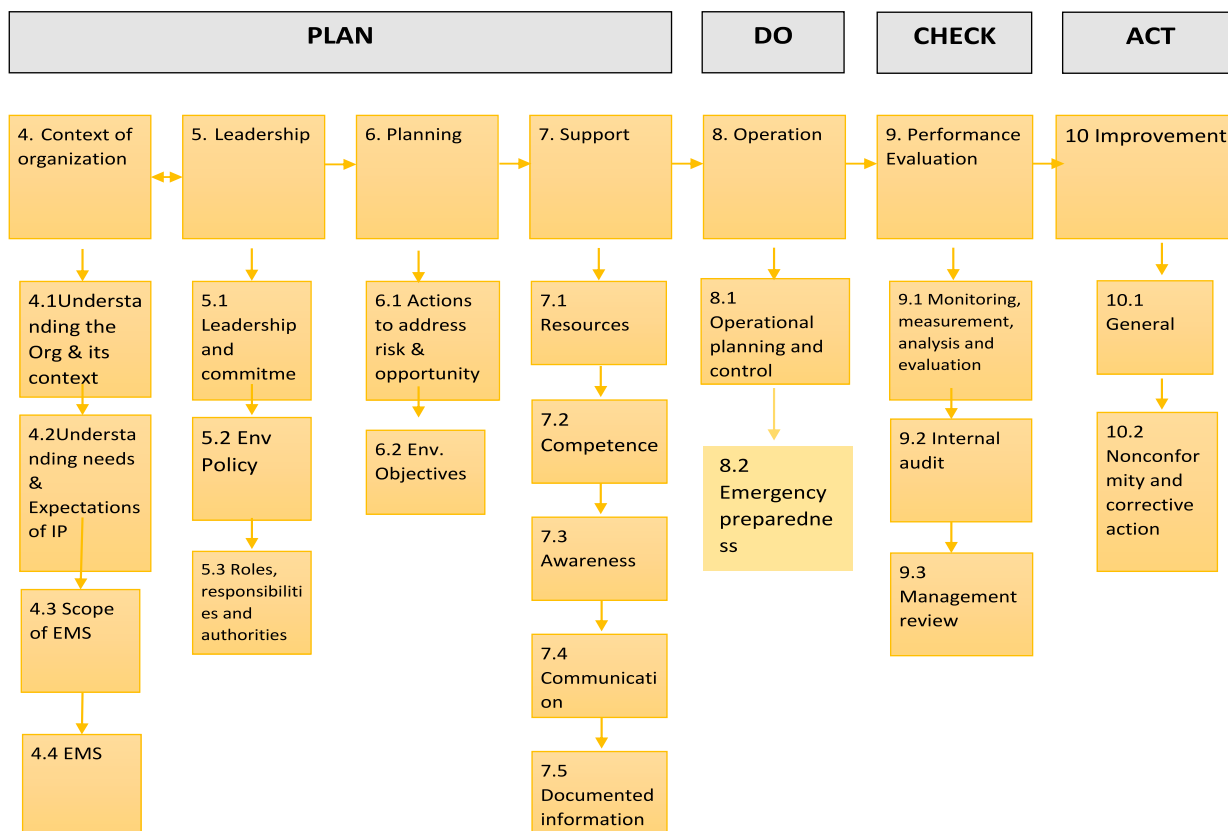


Fig. 3 High Level Structure along with PDCA

4. Context of the Organization

Environmental Context here means environmental conditions related to climate, air quality, water quality, land use, existing contamination, natural resource availability and biodiversity that can either affect the organization's purpose or be affected by its environmental aspects.

4.1 External Context Includes

Cultural, social, political, legal, regulatory, financial, technological, economic, natural/ man-made environment, whether international, national, regional or local;

4.2 Internal Context Includes

The internal characteristics or conditions of the organization, such as its activities, products, and services, strategic direction, culture, and capabilities (i.e. people, knowledge, processes, systems) that may affect the organizations environmental performance.

4.3 Understanding the needs and expectations of interested parties

The organization shall determine:

- Relevant interested parties
- Needs and expectations (i.e. requirements) of these interested parties;
- Which of these needs and expectations become compliance obligations?

4.4 Determining the Scope of EMS

The scope of EMS intended to clarify the physical & organizational boundaries to which EMS applies. In establishing its scope the organization shall consider:

- a) the external and internal issues referred to in 4.1;
- b) the compliance obligations referred to in 4.2;
- c) its organizational unit(s), function(s), and physical boundaries;
- d) its activities, products, and services; considering life cycle perspective
- e) Its authority and ability to exercise control and influence.

All activities, products, and services of the organization within defined scope need to be included in the environmental management system. The scope shall be maintained as documented information and be available to interested parties.

4.5 Environmental management System

Establishment, implementation, maintaining, and continually improve an environmental management system, including the processes needed and their interactions to achieve the intended outcomes, including enhancing its environmental performance.

5. Leadership

- Leadership and commitment
- Environmental policy
- Organizational roles, responsibilities, and authorities

5.1 Leadership and Commitment

Top management shall demonstrate leadership and commitment by:

- Taking accountability for the effectiveness of the EMS;
- Establishing environmental policy and objectives;
- Ensuring the integration of the EMS into the organization's business processes;
- Ensuring the availability of resources;
- Communicating the importance & Conforming to the EMS requirements;
- Ensuring EMS achieves its intended outcomes;
- Directing and supporting employees;
- Promoting continual improvement;

Note: Top management may delegate responsibility for the actions to others, but it retains accountability for ensuring the actions are performed.

5.2 Environmental Policy

Three Basic Commitments to be specified in Policy are:

- To the protection of the environment, including prevention of pollution and other specific commitment(s) relevant to the context of the organization
- To fulfill its compliance obligations
- To continual improvement of the environmental management system

The environmental policy shall be:

- Maintained as documented information;
- communicated within the organization;
- available to interested parties.

5.3 Organizational Roles, Responsibilities & Authorities

- the environmental management system roles, responsibilities, and authorities should be assigned and communicated.

- There is no explicit requirement in ISO 14001:2015 to assigning a “management representative”, yet the responsibilities and authorities still remain.

6. Planning

6.1 Actions to address risks and opportunities – EMS

6.1.1 General

Organizations to determine the risks and opportunities, related to its:

- environmental aspects
- compliance obligations
- other issues and requirements, identified in 4.1 and 4.2;
- Needs and expectations of interested parties.

Maintain documented information of it's:

- risks and opportunities that need to be addressed;
- Processes needed in 6.1.1 to 6.1.4, to the extent necessary to have confidence they are carried out as planned.

Sources/Origins of risks and opportunities:

- increased flooding due to climate change that could affect the organizations premises;
- lack of available resources to maintain an effective environmental management system due to economic constraints;
- introducing new technology financed by governmental grants, which could improve air quality;
- Water scarcity during periods of drought that could affect the organization's ability to operate its emission control equipment.
- environmental spillage due to literacy or language barriers among workers who cannot understand local work procedures;

Note: There is no requirement for formal risk management or a documented risk management process. It is up to the organization to select the method it will use to determine its risks and opportunities. The method may involve a simple qualitative process or a full quantitative assessment depending on the context in which the organization operates.

6.1.2 Environmental Aspects

Determine the environmental aspects and associated impacts of its activities, products and services considering a life cycle perspective.

Organization shall take into account:

- Products and services

- changes, new/modified services/ products.
- abnormal conditions & reasonable foreseeable emergency situation.

The organization shall maintain documented information of it's:

- environmental aspects and associated environmental impacts;
- criteria used to determine its significant environmental aspects;
- Significant environmental aspects.

Life cycle perspective

- When determining environmental aspects, the organization considers a life cycle perspective.
- This does not require a detailed life cycle assessment, thinking carefully about the life cycle stages that can be controlled or influenced by the organization is sufficient.
- Typical stages of a product (or service) life cycle include raw material acquisition, design, production, transportation/delivery, use, end-of-life treatment and, final disposal.

Life Cycle Perspective

The Aspect and impacts from different stages in a product/service life cycle have to be identified and assessed:

1. Raw materials (Source of raw material, impact on the environment due to extraction of resource)
2. Acquisition of raw materials, (Impact from the Transport of raw material to the site and on-site transfer and acquisition process)
3. Design (Impact on the environment due to the designing process and also from design of the product, alternative designs)
4. Production (Aspect and impact of the production process)
5. Transportation/delivery, (Length of the supply chain, Delivery vehicle, route of the vehicle, vehicle maintenance, emissions, congestion, global warming)
6. Use (the life of the product, impact during use, overuse, misuse),
7. End of life treatment (is it necessary to treat waste before disposal if yes then impact of the same on the environment)
8. Final disposal (Different disposal alternatives and their impact on the environment)

Note 1: What is a life cycle?

The life cycle is 'Consecutive and interlinked stages of a product (or service) system, from raw material acquisition or generation from natural resources to final disposal. Life cycle stages include acquisition of raw.

Note 2: The organization can consider those stages in the life cycle over which it has the greatest control or influence as these may offer the greatest opportunity to reduce resource use and minimize pollution or waste.

6.1.3 Compliance Obligations EMS

Mandatory legal requirements related to an organization's environmental aspects can include, if applicable:

- requirements from governmental entities or other relevant authorities;
- international, national and local laws and regulations;
- requirements specified in permits, licenses or other forms of authorization;
- Regulatory agencies orders, rules or guidance
- Court judgements or administrative tribunals.

Note: The organization shall maintain documented information of its compliance obligations.

6.1.4. Planning Action Plan:

To take actions to address its:

- significant environmental aspects;
- compliance obligations;
- risks and opportunities identified by the organization

How to:

- integrate and implement the actions into its environmental management system processes or other business processes;
- evaluate the effectiveness of these actions

When planning organization shall consider

- its technological options and its financial,
- Operational and business requirements.

6.2. Environmental Objectives & Planning To Achieve Them

6.2.1. Environmental objectives

Organization to establish Environmental Objectives and Targets at relevant functions and levels within the organization.

The objectives shall be:

- Consistent with the Environmental Policy
- measurable, where practicable
- monitored
- Communicated
- Updated as appropriate

Organization shall consider

- Compliance obligations
- significant environmental aspects
- risks and opportunities

Documented information on the environmental objectives shall be maintained.

6.2.2. Planning actions to achieve Environmental

Objectives

When planning how to achieve its environmental objectives, the organization shall determine

- what will be done;
- what resources will be required;
- who will be responsible;
- when it will be completed;
- how the results will be evaluated, including indicators for monitoring progress toward achievement of its measurable environmental objectives (see 9.1.1).

The organization shall consider how actions to achieve its environmental objectives can be integrated into the organization's business processes.

7. Support

7.1. Resources

The organization shall determine and provide the resources needed for the establishment, implementation, maintenance and continual improvement of the QMS. Resources includes:

- human resources (specialized skills)
- natural resources
- Infrastructure (buildings, equipment's, treatment systems, tanks, drainage system)
- technology and financial

7.2. Competence EMS

The organization shall:

- determine competence of person(s) doing work that affects its environmental performance and its ability to fulfil its compliance obligations;
- determine training needs associated with its environmental aspects and its EMS;
- take actions to acquire the necessary competence, and evaluate the effectiveness of the actions taken.
- The organisation shall retain appropriate documented information as evidence of competence.

7.3. Awareness EMS

The organization to ensure that employees are aware of:

- the environmental policy;
- the significant environmental aspects/ impact;
- their contribution to the effectiveness of the environmental management system, including the benefits of enhanced environmental performance;
- the implications of not conforming with the EMS, including not fulfilling the organization's compliance obligations.

7.4. Communication

7.4.1. General

- The organization shall determine the internal and external communications relevant to the EMS including.
 - on what it will communicate
 - when to communicate
 - with whom to communicate
 - how to communicate
 - Who communicates
- Ensure that environmental information communicated is consistent with information generated within EMS and is reliable.
- Take into account its compliance obligations.
- The organization shall respond to relevant communications on its environmental management system.

Note: The organization shall retain documented information as evidence of its communications, as appropriate.

7.4.2. Internal Communication

EMS relevant information communication among the various levels and functions of the organization. (all employees, Contractors, Visitors)

7.4.3. External Communication

EMS relevant information communication as established by the communication process(es) and as required by its compliance obligations. (Suppliers, Transport contractors, Govt. offices, Community).

7.5. Documented Information on EMS

- Maintained as documented information are Documents.
- Retained as documented information are Records.
- The documented information associated with the EMS may be integrated with other management systems.
- It does not have to be in the form of a manual.

7.5.1. Creating and updating

- When creating and updating documented information , The organisation shall ensure
- Identification and description (Author, Title, Reference number)
- Format (Language, Software version, graphics) and Media (pare. Electronics)
- Review and approval for suitability and adequacy.

7.5.2. Control of documented Information

EMS documented information shall be controlled to ensure

- It is available and suitable for use.
- Adequately protected (from loss of confidentiality, improper use, or loss of integrity.)
- For document control of documented information the organisation shall address distribution, access, retrieval and use,
- Storage and preservation,
- Control of change (Version control) Retention and disposition.
- External origin document must be controlled.

8. Operation

8.1. Operational Planning & Control EMS

The type and extent of operational control(s) depend on

- The nature of the operations,
- the risks and opportunities,
- significant environmental aspects and compliance obligations.

An organization has the flexibility to select the type of operational control methods.

The organization decides the extent of control needed: within its own business processes (e.g. procurement process)

- to control or influence (an) outsourced process(es) or (a) provider(s) of products and services.
- The organization shall maintain documented information to the extent necessary to have confidence that processes have been carried out as planned,

8.2. Emergency Preparedness and Response

The organization shall:

- the most appropriate methods for responding to an emergency situation;
- internal and external communication process(es);
- the action(s) required to prevent or mitigate environmental impacts;
- mitigation and response action(s) to be taken for different types of emergency situations;
- the need for post-emergency evaluation to determine and implement corrective actions;
- periodic testing of planned emergency response actions;
- training of emergency response personnel;
- a list of key personnel and aid agencies, including contact details (e.g. fire department, spillage clean-up services);
- evacuation routes and assembly points; the possibility of mutual assistance from neighboring organizations.

The organization shall maintain documented information to the extent necessary to have confidence that the process(es) is (are) carried out as planned.

9. Performance Evaluation

9.1. Monitoring, measurement, analysis and evaluation EMS

9.1.1. General

Environmental Performance Monitoring, Measurement, Analysis & Evaluation.

a) what needs to be monitored and measured;



Fig. 4. Operation planning and control as per ISO 14001:2015

- b) the methods for monitoring, measurement, analysis and evaluation to ensure valid results;
- c) the criteria to evaluate its environmental performance, and appropriate indicators;
- d) when the monitoring and measuring shall be performed, results analysed and evaluated.

The organization shall retain appropriate documented information as evidence of the monitoring, measurement, analysis and evaluation results.

9.1.2. Evaluation of compliance

The organization shall establish, implement and maintain the process(es) needed to evaluate fulfilment of its compliance obligations.

The organization shall:

- a) determine the frequency that compliance will be evaluated;
- b) evaluate compliance and take action if needed;
- c) maintain knowledge and understanding of its compliance status.

The organization shall retain documented information as evidence of the compliance evaluation result(s).

9.2. Internal audit

9.2.1. General

The organization shall conduct internal audits at planned intervals to provide information on whether the environmental management system:

- a) conforms to:
 - 1) the organization's own requirements for its environmental management system;
 - 2) the requirements of this International Standard;
- b) is effectively implemented and maintained.

9.2.2. Internal Audit Programme

The organization shall:

- a) define the audit criteria and scope for each audit;
- b) select auditors and conduct audits to ensure objectivity and the impartiality of the audit process;
- c) ensure that the results of the audits are reported to relevant management.

The organization shall retain documented information as evidence of the implementation of the audit programme and the audit results.

9.3. Management Review EMS

During Management Review Meetings the organization shall discuss information on the EMS performance, including trends and indicators for:

- Feedback from relevant interested parties
- monitoring and measurement results;
- Performance of external providers

- Adequacy of resources
- Effectiveness of actions taken to address risks and opportunities
- Risk and opportunities
- Its Significant aspects

10. Improvement

10.1. Improvement -General

- Implement actions to meet interested party requirements
- improving products and services to meet requirements and Future needs and expectations
- Correcting , Preventing or reducing undesired effects.
- Improving performance & Effectiveness of the EMS.

NOTE: Can also include Correction, Corrective Action, Continual Improvement, breakthrough change, innovation, re- organization.

10.2. Non-conformity and corrective action

When a non-conformity occurs, the organization shall:

- a) **react** to the nonconformity, and as applicable take action to control and correct it, and deal with the consequences;
- b) **evaluate** the need for action to eliminate the causes of the non-conformity in order that it does not recur or occur elsewhere, by reviewing the nonconformity
 - determining the causes of the nonconformity, and
 - determining if similar non-conformities exist, or could potentially occur;
- c) **implement** any action needed;
- d) **review** the effectiveness of any corrective action taken;
- e) **Update** risks and opportunities determined during planning , if necessary.
- f) **make changes** to the EMS, if necessary."

The organization shall retain documented information as evidence of:

- the nature of the non-conformities and any subsequent actions taken;
- the results of any corrective action.

10.3 Continual Improvement:-

- The organization shall continually improve the suitability, adequacy and effectiveness of the EMS to enhance environmental performance.



ISO-14001:2015 DOCUMENT REQUIREMENTS FOR IMPLEMENTATION

D.B. KOHLE

Proactive Safety Consultant

Email: dbkolhe@yahoo.co.in

The Organisations environment management system shall include,

- a) Documented information required by standards.
- b) Documented information determined by the organisation as being necessary for the effectiveness of the environment management system.

A) Creating and Updating (Clause 7.5.2)

When creating and updating documented information ensure appropriate

- 1) Identification and description (Author, title or related number)
- 2) Format (e.g. Language ,Software ,version and media paper or electronic)
- 3) Review and approval for suitability and adequacy

B) Control of documented information;

Documented information shall be controlled to

- 1) Ensure that all relevant documents are available at place of use.
- 2) Adequately protected (from loss of confidentiality, improper use, loss of integrity and damage.

C) For the control of documented information the organisation shall the following activities in place.

- 1) Access, distribution of copies, retrieval and use.
- 2) Storage and preservation including preservation of legibility.
- 3) Version Control is control of changes.
- 4) Retention period and disposition method.

External Originated documents as identified by Organisation shall be identified as appropriated and controlled.

D) The following documents are required for compliance of Environment Management System (ISO-14001:2015)

Mandatory Documents (Maintained document information)

- 1) Scope of Environment Management System. Clause-4.3)
- 2) Organisations Environment Policy. (Clause 5.2)
- 3) Process for addressing environmental risks and opportunities ,Planning actions to address risk and opportunities.(Clause 6.1.1)
- 4) Environmental aspects and associated impact process (Clause 6.1.2)
- 5) Criteria used to determine its significant environment aspects.
- 6) Significant Environment Aspects. (Clause 6.1.2)
- 7) Documented information on Compliance Obligation (6.1.3)
- 8) Environmental objectives and plane for achieving them. (Clause 6.2.1)
- 9) Documentation on process carried out with confidence and planned manner (Clause 8.1)
- 10) Emergency Preparedness and response process (Clause *8.2).

Mandatory Records Required for ISO-14001 Compliance. (Retain Documented Information)

- 1) Environmental risks and opportunities and actions for addressing for them. (Clause 6.1.1)
- 2) Evidence of compliance obligations. (Legal requirements clause 6.1.3)
- 3) Environmental aspects Impacts (Clause-6.1.2)
- 4) Planning actions for environmental objective.(EMS Programs 6.2.2)

- 5) Evidence of Competence (Clause 7.2)
- 6) Evidence of Communication (External and Internal. Clause-7.4.1)
- 7) Record control and retention and disposition (Clause 7.5.3)
- 8) Environment Management procedures, Objective Programmes.(8.1)
- 9) Plans for responding the potential environmental emergency situation (Clause 8.2) (for Types of emergencies ,Mock drill reports,)
- 10) Maintenance, calibration or verification, monitoring measurement, analysis, and evaluation results documents. (Clause 9.1.1) (Measurement equipment used for environment like water meter, Explosive meter, Fire pressure gauges, Transmitters etc)
- 11) Compliance of evaluation results. (9.1.2)
- 12) Internal Audit Program (Clause 9.2.2)
- 13) Management review reports (Clause 9.3)
- 14) Opportunities of environmental performance improvement necessary actions and results(Clause 10.1)
- 15) Nature of conformities and any subsequent actions taken.
Environment incidents investigation,(Clause 10.2)
- 16) Evidence of results of continual improvement. (Clause 10.3)

Non Mandatory Documents

To implement and maintain Environment management system as per ISO-14001:2015 there are numerous documents which can be used for compliance.

- 01) Procedure for determining context of the organisation and Interested parties (Clause 4.1)
- 02) EMS Manual Clause 4.
- 03) External internal issues on Environment (Clause 4.1)
- 04) Support from top management for implementing EMS system. e.g. Budget, Manpower etc.
- 05) Define roles and responsibilities and accountabilities for achieving Environmental results.
- 06) Procedure for determining environmental aspects impacts and significant aspects. (Clause 6.1.2)
- 07) Procedure for identification and updating of legal requirements (Compliance obligations) (Clause 6.1.3)
- 08) Environment management objectives (EMP) selection and implementation.(Clause 6.2.2)
- 09) Training calendar and training procedure on Environment and its effectiveness (Employees, Contractors, suppliers, Visitors)
- 10) Tools used for making awareness on EMS
- 11) Procedure for communication (external ,Internal, Contractors, Visitors , Vendors)
- 12) OCP Procedures for Operational planning and control for environment. (e.g. ETP ,STP operation, Hazardous waste storage and disposal, Spill Control, Tracking of consumption of electricity and water etc.
- 13) Procedure for monitoring, measurement and analysis and evaluation i.e. Air ,Water ,Soak pit, stacks analysis etc (Clause 9.1.1)
- 14) Procedure for evaluation of compliance.(Clause 9.1.2)
- 15) Procedure for Internal audit (Clause 9.2.2.)
- 16) Procedure for Management review (Clause 9.3)
- 17) Procedure for investigation of Environmental incidents and actions to be taken (Clause 10.1)
- 18) Procedure for management of non conformities and corrective actions (Clause 10.2)
- 19) Procedure for continual improvement.
Trending graphics for reduction in pollution consumption, Include Kaizens and 5S (Clause 10.3)
- 20) Procedure for Housekeeping.
- 21) Outsourced process control records.(Clause 8.1)
- 22) Tank, Equipment Cleaning. Vessel entry procedures.
- 23) Various inspection sheets like Spill control Kit, First aid box, PPE Inspection Environment equipment maintenance sheets. Drainage inspection. Fire cabinet inspection, Fire tools.etc.
- 24) Calibration procedure for Explosimeter, Oxygen meter, thermometers etc.
- 25) Work permit Procedures for safe maintenance (Hot work permit and Cold permit).



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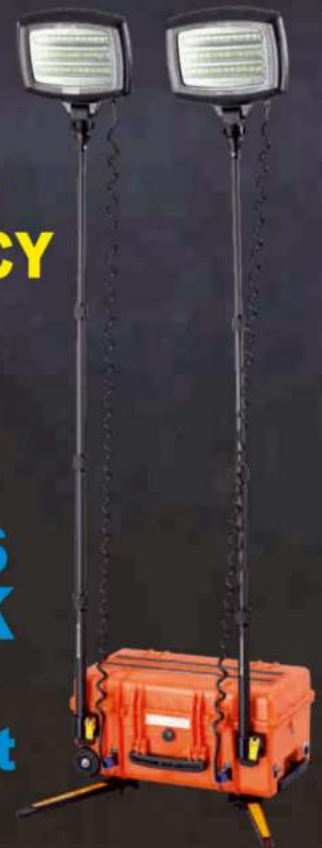
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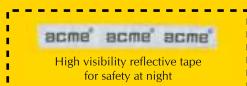
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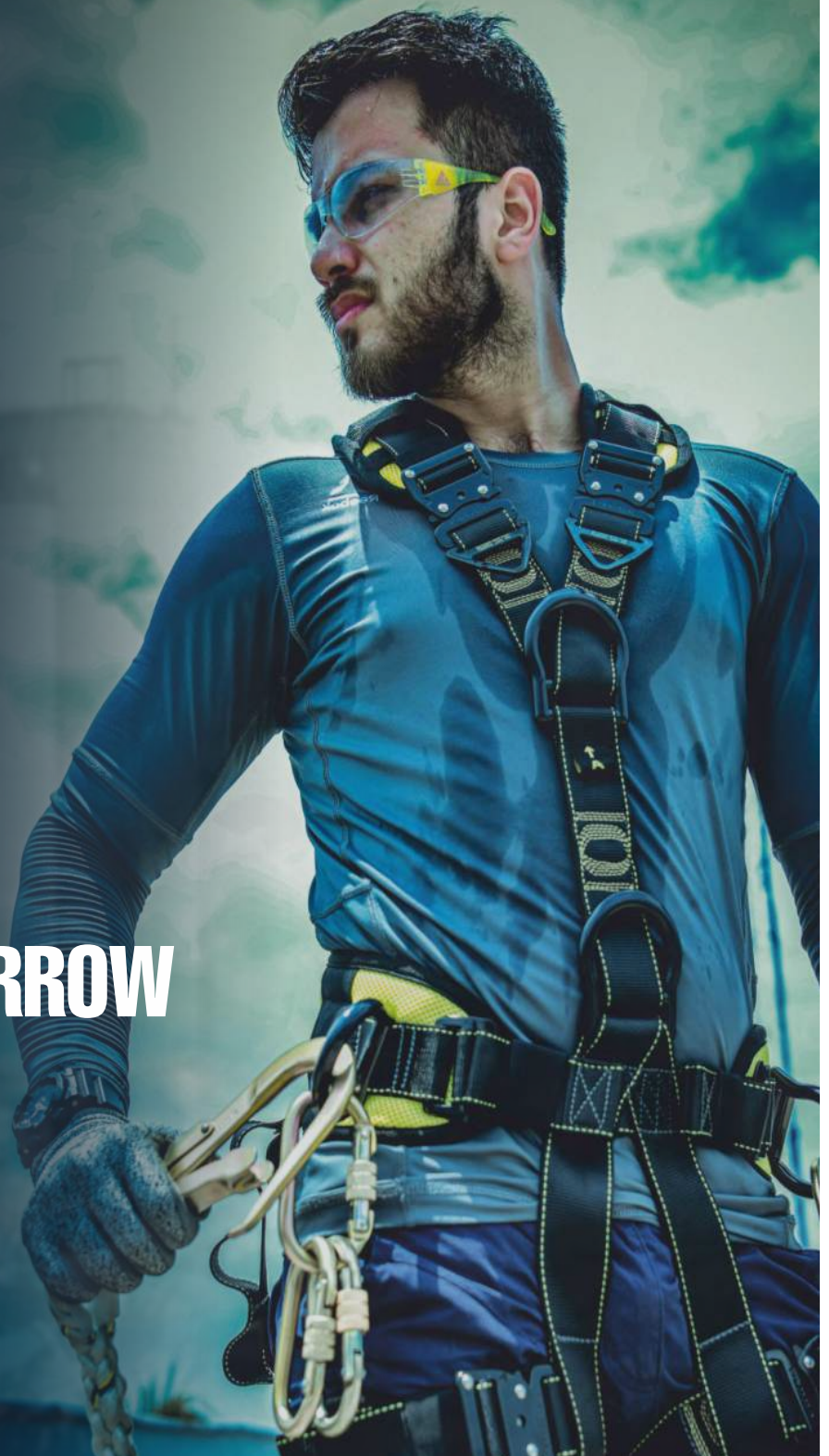


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HOW TO ENSURE SAFE WORK FROM CONTRACTORS

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Monitoring

1. Introduction

Companies hire contractors or service providers to perform services that they cannot either they don't have the expertise or resources or not economical to perform. In those situations, the contractor or service provider hired is assuming the risks associated with the service. However; simply hiring a contractor to perform a service does not absolve the Principal Employer of the obligations to provide a safe place of work.

If these contractors are working on hazardous work coupled with the lack of familiarity about the existing hazards, often pose serious challenges on safety. In many cases the work has to also be completed within a short period of time and temptations may always be there for the contractor to bypass certain safety controls in order to complete activities quicker.

As per Indian labour statutes, Principal Employer is responsible for ensuring safety of all including that of contractors, so it is indeed necessary for the management of the Principal Employer (now onwards referred as merely the Management) to consider risks that those contractors pose and take action to reduce /eliminate them. Hence it is essential to develop a contractor safety system that involves their Induction, Training, Monitoring & Supervision.



Training

This can be challenging, particularly if the Management use multiple contractors – setting up a safety committee with a specific responsibility for contractors is a good way to do this. The Management is responsible and held accountable for their contractors' safety performance. They need to manage them because they have strong performance and safety numbers and they want to keep it that way."

2. Fostering a Safety Partnership

Safety Management of Contracts should ideally consist of a safety partnership between the company (Principal Employer) and the Contractor, both dedicated to improving safety, while simultaneously maintaining the legalities of the contractual relationships. Such safety partnerships will be a hallmark of companies that had achieved excellence in Contractor safety.



Induction

Supervision

3. Phases of Contract Safety Management

3.1. Phase 1: Pre-contract Phase

3.1.1. Planning

Following activities should be undertaken by the Management:

- What is the job the contractor will handle? Define it,
- Jot down points as to how can it be done safely?
- Develop Safety Plan for different activities based on Job Safety Analysis (JSA)
- Identify hazards and safety requirements from the contractor
- Assess risk in contractor's activities of his work
- Eliminate/reduce identified risks
- Specify safe conditions
- Establish Contractor Expectations
- Compile information to be provided to the contractor and list down information to be obtained from the contractor

This step is about how to plan the contractor's job. This step will additionally enable both the Management and the contractor to understand better about practicalities of risk assessment and planning to reduce risks. However, risk assessment is a joint activity of the Management and contractor.

3.1.2. Choosing a Contractor

It's not uncommon to go for the short-cut approach, especially if the job is small or sudden. To save money or time the Management may try to sort it out themselves or call in someone they know, not always the most competent person, to get the job done faster and/or cheaper.

Since the use of contractors is increasing, choice of contractor can have a big impact on safety in the plant.

This step looks at how to assess contractor's suitability including competence before making the choice. After working through this step, the plant management should be able to describe what is involved, identify some safety questions to ask contractors and explain benefits of using preferred contractors.

• Successful selection of contractors

The Management should handle issue of contractor selection with care. It is not something to do casually. It could be said that since contractors are not as familiar with the industry as the ir potential employees, selecting them needs even greater attention.

• Spell out the conditions

The Management should spell out the conditions the contractor has to fulfil and select the one best equipped to meet them. Safety is one of such condition. Identify safety procedures associated with the job and include them in the contractor's specification. When bids are received, check them against the specification to make sure that proper provision has been made for controlling risks.

• Deciding factors about the contractor

- **Availability** – contractor is available ... but does it know about hazards of working at site?
- **Cost** – contractor is the cheapest ... but is he the safest?
- **Technical competence** – contractor seems technically competent ... but last time when they were on site there was an accident!
- **Reliability** – contractor did the job last time ... but sent different people each day.
- **Safety** – check their Safety Policy, Performance and Procedures

Main contractor may have a safety method statement and a safety policy. But sometimes their subcontractors are just a couple of men and the contractor leaves confidential to get on with it. Give main contractors site rules and go through it with them. They have to abide by them if they want the work. Management should be very strict about use of subcontractors and ensure the main contractors know their responsibilities about use of subcontractors and ensure the main contractors know their responsibilities.

• Build relationships to set up preferred contractors

This happens over time and has definite advantages. Check their safety record from time to time and keep them in touch with your rules and standards. Company will have a contractor in place with considered and reliable arrangements for safe working. It can save carrying out a complete selection process every time.

• Use your contacts in the business

Promote network of plants in the surrounding area. Find out from them who they think has a professional approach. Use contacts what they know about the contractor's safety competence.

- Use informal networks – listen to others in your plant. People on site may have heard of experiences with particular contractors or have seen a contractor at work in a different context.
- Interview different contractors – ask them for information. Get them to say how they work, what they know about safety and how they implement their own safety policy. Use Checklist: Questions for contractors below.

Checklist: Questions for Contractors

• Experience

- What experience do you have of our type of plant?
- How familiar are you with the hazards in the plant like this?
- Have you done this sort of job before? What are the main problems?
- Can you provide existing risk assessments, safety method statements, for a similar job?
- Can you provide some references?

• Safety policy and practice

- Do you have a health and safety policy?
- Has factory inspectorate ever taken action against you?
- What are your safety procedures?
- Do you plan to use any subcontractors?
- Will you provide a safety method statement for this job?
- What safety checks do you make on equipment and materials?

• Training and competence

- Are you a member of any trade/professional body?
- How do you ensure your subcontractors are competent?
- How do you prepare them for working safely on site?
- What safety training can you provide to your workers?
- How is information about safety passed on to your employees and subcontractors?
- Can you show us any of your typical training programme and records?

• Supervision

- How do you plan to supervise this job?
- Who will be responsible for supervision on site?
- How are changes which arise during a job dealt with?
- How will you liaise with us?
- If you identify a problem, what action do you take concerning your employees or subcontractors?
- Will you report incidents/accidents to us? How do you plan?
- Are you prepared to abide by this company rules?

3.2. PHASE 2 : Create Contract Phase

3.2.1. Contractor Pre-Qualification

Objective of this section is to assess a potential contractor against a variety of criteria during the pre-qualification process to ensure that they can meet the hiring company's standards for performance (e.g. expertise, job quality, availability, risk assessment, audits, & references). This will provide a clear understanding of a potential contractor's capabilities and past performance.

3.2.2. Review Contractor's Workforce Capabilities and Qualifications

Request that the contractor to provide a written description of their company including its general activities, areas of expertise, length of time in the business, personnel, and experience in the industry.

3.2.3. Evaluate the Contractor's Performance

Ask the contractor to provide relevant information that can be used to evaluate performance with respect to:

- Insurance
- Engineering standards
- Emergency preparedness
- Use of management systems
- Health, safety and environmental statistics
- Hazard assessment process
- Previous audits
- Certification

3.2.4. Determine Contractor's Ability to meet Performance Expectations

Ask contractor to provide the following information as part of the bid package:

- Evidence that the contractor has appropriate personnel and resources available to complete the proposed work within the time frame established by the management
- Information on how the contractor or service provider typically addresses the assessment and management of risk. The response should include information on identifying, prioritizing, mitigating and managing risks especially those types of risk inherent to the work under consideration
- Description of hazards and conditions the contractor would expect to encounter on the job

Description of the process the contractor would take to eliminate or reduce the expected hazards

- List of hazardous materials that may be introduced by the contractor at the work site
- Statement of commitment that the contractor will comply with applicable regulatory requirements and conditions of the jurisdiction in which the work will be performed
- Commitments regarding participation in pre-job meetings and site orientations
- Commitments for ongoing communication during the work period concerning hazards identified, site inspections, incidents, and other health, safety and environmental issues
- Processes for reporting and investigating any incidents that may occur
- Validate the contractor's ability to successfully complete the work.

3.2.5. Actions for Contractor Pre-Qualification and Selection

Actions to Take	Prequalification and Selection Information
Review contractor: • Workforce capabilities • Certifications • Qualifications	
Evaluate contractor performance – review contractor information regarding: • Insurance • Engineering standards • Emergency preparedness • Management systems • Statistics • Hazard assessment process • Previous audits • Quality control	
Determine contractor's ability to meet performance expectations	
Prepare a risk mitigation plan to address contractor or service provider deficiencies	

3.3. PHASE 3: Contract Phase

3.3.1. Choose and Develop the Agreement

Importance of including all of Principal Employer's expectations in an explicit way cannot be overemphasized. Clarity of expectation can also support the demonstration of due diligence. It is important to think carefully about all requirements that the contractor is to meet and ensure that they are included in the agreement.

3.3.2. Consider the Agreement Relative to Requirements

Be aware that whatever type of agreement is selected, do the following:

- Consider if the agreement will be stand alone or become part of another contract
- Consider how the requirements in the contract will be managed

- Consider the purpose of the agreement in consultation with the contractor to ensure longterm support of the agreement
- Consider priorities in relation to other technical and business components of the agreement
- Consider how authority and responsibilities assigned to contractors under agreements fit with the Principal Employer's overall management
- Consider that this contract will be binding to both parties
- Consider obtaining a stakeholder and legal review of the agreement

3.3.3. Define the Specific Content that will be included in an Agreement

- Regardless of the type of agreement that is selected, consider the criteria that will be included.

These could include following:

- Definitions
- Contracting Procedure
- Supply of / Provision of Equipment, Materials, Supplies and Services
- Operations / Servicing Methods and Practices
- Reports to be Furnished by the Contractor
- Early Termination of Services and Contractor Compensation
- Take Over
- Payments to Contractor
- Allocation of Risk and Liability/ Risk and Loss Indemnity
- Insurance
- Assessments, Liens and Third Party Charges, With holding Payment, Deductions and Set Off
- Laws, Rules and Regulations
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- Safety and Performance Summary
- Equipment to be provided by the Designated Party
- Camp and Crew Facilities to be Provided by Designated Party
- Additional Insurance Coverage
- Compensation
- Special Provisions
- Designated Representatives

3.3.4. Develop an Agreement

A valid agreement must have the following four components:

- i. An agreement of offer and acceptance
- ii. An exchange of value by both parties
- iii. A legal ability to contract (i.e. authority, age)
- iv. Purpose (legal agreement to do or not do an action)

3.3.5. Define General Roles and Responsibilities

Clearly define in the contract the roles and responsibilities that all parties will have during the execution of the work.

3.3.6. Identify General Expectations

Identify expectations of both parties regarding completion of the contracted work.

3.3.7. In the Agreement provide clear Health, Safety and Environmental Responsibilities for both Parties. Following are minimum:

- Requirement to comply with occupational health and safety laws and industry standards — spell out that Principal Employer's Safety Policy will be followed.
- Every employer has the responsibility to ensure health and safety of workers present on the work site
- Contractor will designate a person who will be looking after safety aspect of the work and the plant management would designate a nodal officer to liaise with him.
- Contractor would develop a safety programme, get it approved by the plant management and implement it. The Contractor would report monthly progress report on its implementation through routine safety report.
- Contractor would take written permission from the plant management for hiring a sub-contractor.
- Contractor must ensure all of their employees are aware of their safety responsibilities
- Contractor should indemnify (reimburse) the company for any and all costs related to a safety violation caused by the contractor
- Contractor should cooperate in the event of an injury or incident
- The Plant Management and contractor must ensure that there is adequate supervision of the work site
- Contractor is basically responsible its workers for providing competent supervision, training, and preventing violence and harassment in the workplace (physical and psychological harm, which includes sexual and domestic violence)
- Contract would prepare written Safe Operating Procedures (SOPs) duly approved by the Plant Management and make them suitably known to its

workers.

- Both parties are responsible to ensure that current assessments, checklists and procedures are available for all critical tasks
- Any party who has equipment under their control that is hazardous to other workers is obligated to immediately implement appropriate hazard controls
- The contractor must have in place a right to refuse unsafe work processes
- Contractor must prepare & implement On-Site Emergency response plans complementing the Plant's.

Contractual Safety Clauses

- **These contractual safety clauses form an integral part of the contract**

• Knowledge of the documentation

The parties confirm that the Contractor has established the price and its various components on the basis of a careful and detailed examination of all the necessary documentation provided and, where required, after a direct and joint inspection of the site where the work is to take place. The Contractor shall take all necessary measures to ensure compliance with existing Indian legislation, the Company's Rules, which form part of this document. The Contractor shall in particular take account of on-site emergency plan of the plant in which the work is to take place. If the services are to be conducted off-premises, the Contractor must have been provided with the Emergency Plan for the site of the work.

• Obligations of the Contractor

The Contractor undertakes to comply with applicable Indian legislation on safety at work and the internal rules of the plant site. The Contractor will have complete freedom to organise the workplace/site assigned by the Plant (employees, resources and equipment) as he sees fit, while complying fully with the work schedules and instructions given by the Plant Management. The Contractor must forward a copy of the Accident Register to the Plant's Safety Department. The work must be carried out during the working hours of the plant site, taking into account the annual holidays observed by the Plant site. Exceptions to this will only be permitted if duly justified and if the Plant Officers responsible for supervising the work are present on the site.

• All persons employed by the Contractor working on plant premises must at all times visibly wear a badge provided to them upon entering the plant, or an identity card. Contract employees doing manual work should also wear a badge issued by the Plant Management whilst they are on the site area. However, a company badge must be worn in a visible position at all times when inside the plant. If the work is expected to last for more than two months, the contract employee will be provided with a special badge.

• Use of machinery and equipment

All machinery and equipment required for the performance of this contract must be the property of the Contractor, unless otherwise stipulated in the contract. Use of machinery and equipment made available under lease, hire or rental agreements shall also be authorised, if notified in advance by the Contractor. In the event of force majeure, the use of plant's equipment on a temporary basis shall require the plant's express authorisation in writing. When taking delivery of any machinery, equipment or any other item loaned for use on a temporary basis, the Contractor shall check that it is in perfect condition and has been made safe, if necessary, and must take complete responsibility for the use thereof from that moment on. Delivery will be confirmed by means of a special note signed by both the Contractor and the Plant Management. Machinery and equipment owned by the Contractor and brought onto the site must be listed in detail so that it can be easily identified. No equipment or materials belonging to the Contractor may be left on the site but must be removed promptly.

• Employee details

Before work commences, the Contractor shall give the Management names of his own employees or of those employed by any subcontractor who will be performing work under this contract. The employee list should include their personal details, qualifications, date of recruitment and social security and insurance details. The Plant Management reserves the right to refuse any employee listed, without providing a reason for its decision. In case of construction work a copy of the employee registration should be made available to the Management. The Contractor shall ensure that each of his employees comes to work with the necessary identification documents for access, the badge provided by the Plant Management. The Contractor shall inform the Management in good time of any changes in his or the sub-contractors' employees. The Management may require that the contractor's employees

wear distinctive clothing or other agreed identification.

• Contractor employees compliance with safety regulations

The Contractor must require his employees to comply with Indian regulations relating to safety and require his supervisors to check that they do. The Contractor shall also:

- apply the hygiene and safety measures stipulated by current Indian law;
- ensure that his workers, self-employed workers or subcontractors are given detailed information regarding workplace hazards
- take steps to ensure and require that his staff comply with safety standards and use Personal Protective Equipment;
- ensure that his or his sub-contractor's employees, are aware of all Company rules, fire protection procedures and regulations applicable at the site where the work is to be carried out, of which employees will have been informed. The Plant's working hours are to, Monday to Friday.

The Management has the right to enter the workplace/site and suspend all or part of the work if they discover serious breaches of safety rules. The Management may insist on the removal of persons employed by the Contractor/subcontractor failing to comply with the safety requirements arising under this contract and attributable to the contractor or subcontractor.

• Delegation

The Contractor shall appoint a Site Contract Manager to be responsible for the management, technical assistance, supervision and monitoring of the work covered under this contract, whom the Contractor shall have provided with all the powers and facilities he requires to represent the Contractor to the Management. The Management shall notify the Site Contract Manager, or authorised deputy, of any provisions (even verbal ones) relating to the production of the report which is the subject of the contract. In order to exercise these responsibilities, the Site Contract Manager (or authorised deputy) must at all times be present at the site where the work which is the subject of this contract is to be carried out. The Management must be given the name of the Site Contract Manager (and of his deputy) and a copy of the document authorising them to perform his duties before work commences.

• Inspection of work sites and Interference Risk

Assessment Single Document

Before the start of the work, the Contractor shall assist the Management, in producing the Risk Assessment Document, by conducting its own Risk Assessment and sending the risk assessment to the Management, so that it can be included in the Risk Assessment Document. In order to do this, the Contractor undertakes to conduct, with the Management, a detailed joint inspection of the site where work is to be carried out and to produce the relevant joint inspection report to assess, first hand, the risks connected to the work and to recommend any necessary/useful preventative or protective measures. During the inspection, the work areas relevant to all phases of the tender will also be established. Where possible, the Contractor shall ensure that these areas are closed off before work begins, using the appropriate barrier tape, barriers and signs. Where this obligation applies, it must be noted in the inspection report or Operational Safety Plan. The Site Contract Manager may only commence work once the Risk Assessment (this being produced following the joint inspection and the production of the relevant report) and the Operational Safety Plan for the sites have been produced and delivered to the Management, and following the formal approval of these documents by the Management

• Procedures in the event of incidents or accidents

The Contractor is required to ensure that his employees comply with the following procedures:

• Accidents involving personal injury

- In the event of an accident involving personal injury during Medical Service working hours (Monday/Thursday 08:30-17:30, Friday 08:30-16:30), the Medical Service must be informed immediately (telephone extension) and will give appropriate instructions and call for an ambulance if required. In the event of an accident outside Medical Service working hours, please call extension; an ambulance will transfer the accident victim to the nearest hospital (give name).

- The Contractor must notify the Security/Safety Department of all incidents/ accidents immediately.

- Accidents involving damage to property Situations likely to cause damage to property must be notified immediately to the emergency team on extension In the event of accidents involving no personal injury, the Safety Department must be notified as soon as possible (on telephone extension.....).

• Alarm in the event of an emergency

Please refer to (give reference).

• Infringements discovered by the Management

If the Management learns, through its own departments or own source, that the Contractor has infringed provisions on safety, accident and occupational disease prevention, it may impose following sanctions on the Contractor as considered necessary in view of seriousness of infringements & number which have occurred:

- a. an oral reprimand;
- b. a written reprimand;
- c. removal of the person(s);
- d. removal of the Site Contract Manager;
- e. full or partial suspension of the work assigned to the Contractor;
- f. termination of the contract.
- g. Fine ranging from to

The Contractor is hereby informed that any termination of the contract under point f) may prejudice his future involvement in tenders for the performance of works or services on behalf of the Company. In any event, the Company reserves the right to claim compensation for damages incurred as a result of breach of contract, negligence or incapability on the part of the Contractor.

3.3.8. Contract Implementation

The objective of this section is to provide guidance to the Plant Management representative interacting with contractors on work sites. This section covers everything from initial on-site orientations and monitoring contractor performance to taking steps for improving performance.

Consider the following actions based on the complexity of the contract:

- i. Determine supervisor's responsibilities and communicate who is in charge.
- ii. Define requirements for orientations
Take the following actions to establish an orientation process on all work sites:
 - Advise all contractors and service providers that they must participate in a site specific orientation session that includes job scope and hazard identification prior to commencing work at the job site
 - Ensure that the orientation contains:
 - Company specific information
 - Site-specific information
 - Required permitting processes
 - Ensure the orientation includes information on the company's health, safety and environmental

- management system, its rules and expectations, specific procedures that the contractor must follow, emergency response plans, and the specific hazards of the work site
- Site specific information must be relevant to the conditions at the work location.

iii. Conduct Effective site-specific orientations

Following list provides points for effective orientation on a work site: Arrange to have orientations conducted by competent individuals

- Use two-way communication and gather feedback in the course of on-site orientations to ensure information is understood and agreed upon
- Schedule site-specific orientations for first day new individual joins the work site
- Have all workers sign an acknowledgement form at the conclusion of the orientation or require the contractor to sign the pre-job or tailgate meeting form
- Provide a copy of the signed form (i.e. orientation, prejob or tailgate) to the contractor and file original
- Suggest that the individual carries the signed acknowledgement at all times on the work sites (e.g. as a wallet card)
- site entry, access and amenities;
- relevant business policies;
- relevant safety procedures for the work they are required to undertake; and
- emergency response procedures.

An induction (Orientation) also gives the management opportunity to assess whether appropriate personnel have been engaged to do the work and to check any licences or permits required to perform the work. It is important that Management keeps records of all inductions and a signed statement from each contractor indicating they have completed the induction.

iv. Monitor the contractor through:

- a. Routine inspections of contractor performance
- b. Evaluations
- c. Formal audits of the contractor's health, safety and environmental management system

v. Conduct performance reviews and provide feedback

Actions to Implement an Agreement

Action to Take	Agreement Information
Consider the agreement relative to requirements	
Choose the most appropriate type of agreement	
Define specific content to include in the agreement	
Develop an agreement : =	

3.4. Phase 4: Contract Evaluation And Feed-back Phase

3.4.1. This phase should never be underestimated as it is a time when both the contractor and Plant Management can reflect on their work together. They should address their compliance with the Safety Plan and discuss how they have performed in accordance with any performance indicators that may have been initially set. In general, lessons learnt, whether they are positive or negative are to be discussed to ensure the organization improves in the areas of concern. The phase is also important as it is a record that can be used for potentially evaluating the contractor if their services were to be used again. Such information is usually kept by the company contracts or procurement departments to refer to when required in the future.

In conclusion, most contractor programs tend to focus solely on managing risk. In other words, money and contract cost appear to be the primary driving factors when it comes to employing any contractor.

Another way to look at this, however, is that safety is just good business. Screening for high incident rates and avoiding contracts to high-risk contractors not only reduces liability and insurance claims but creates safer work sites and increases the potential profitability for all parties involved.

Use information gathered during inspections, evaluations and audits to assess performance. Following steps help in the evaluation at the end of contracts or at significant points during the contract:

- Ensure non-compliance issues (regulatory and contractual) identified during inspections and audits
- Discuss with Contractor additional recommendations resulting from inspections and audits
- Identify areas where all parties can work together to improve performance during the continuation of the contract, or on the next contract
- Discuss and develop an action plan for dealing with any identified deficiencies
- Document and monitor the implementation of the action plan to ensure that recommendations are effectively put in place.

3.4.2. Track Performance Assessments to ensure consistent communication and ongoing improvement:

- Develop tools for documenting and tracking the performance of contractors
- Compare collected information to established benchmarks, targets or goals for contractor performance
- Ensure the collected information is discussed with the contractor and used as the basis for improving performance
- Develop and implement a process for implementing corrective actions
- Provide a means for both parties to communicate and resolve issues that cannot be resolved on site

4. Supporting Activities/Plans

4.1. Safety Training

The Management should create a comprehensive contractor Safety Training Matrix which determines what training every contractor discipline would require based on the activities that will undertake. Safety Department and training personnel together

should ensure a thorough training analysis of the needs has been made. The matrix should also determine what training will be offered by the Management, what training would be undertaken by the Contractor. As much as possible the safety Training matrix would need to be shared with the contractor early on during the planning phase itself.

4.2. Contractor monthly Safety reports and meetings

The Management should provide the contractor with a pre-set monthly report format in order for them to highlight essential safety information such as injuries, accidents, property or environmental damage. Man hours worked may also be necessary in order for the client organization to be able to compile comprehensive overall lost time reports.

Meetings with the contractors are also encouraged to determine some of their concerns. It is also an opportunity for them to highlight their achievements and discuss any lessons learnt as a result of incidents or accidents. The meetings are also a way to enhance an overall stronger safe work culture.





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RESPIRATORY PROTECTIVE EQUIPMENT - DIFFERENTIATING THE RESPIRATORS FROM MASKS

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Respiratory Protective Equipment (RPE) is a particular type of Personal Protective Equipment (PPE), used to protect the individual wearer against inhalation of hazardous substances in the workplace air. RPE should only be used where adequate control of exposure cannot be achieved by other means, in other words, as a last resort on the hierarchy of control measures. It is required to firstly attempt to eliminate the hazard at source and PPEs should only be used after all other reasonably practicable control measures have been taken. PPE is considered a last resort because it only protects individual workers, is prone to failure or misuse, such as wearing the wrong RPE for the job, and employees wearing RPE may get a false sense of security when using it.

Most of us have either of the times might have used a mask and / or respirator too. Respirators are generally called as masks and many people might not be aware of the difference between the two. This article is specially being written to clarify difference between the two and also other various technicalities involved in the same.

With the novel coronavirus outbreak globally, many people are understandably concerned about their health and safety. In the recent past, N95 series of masks have become more popular and demanding due to wide spread out this pandemic. The demand of the said masks have been so high during recent past few months that one could not get even single piece in market. Efforts have been done to consolidate the detailed characteristics, specifications and various standards that are followed for the manufacturing of various types of Respirators.

Respirators vs Masks

As per EN 149: 2001, a particle filtering half mask covers the nose and mouth and the chin and may have inhalation and/or exhalation valve(s). The half mask consists entirely or substantially of filter material or comprises a face piece in which the main filter(s) form an inseparable part of the device. It is intended to provide adequate sealing on the face of the wearer against the ambient atmosphere, when the skin is dry or moist and when the head is moved. Air enters the particle filtering half mask and passes directly to the nose and mouth area of the face piece or, via an inhalation valve(s) if fitted. The exhaled air flows through the filter material and/or an exhalation valve (if fitted) directly to the ambient atmosphere. These devices are designed to protect against both solid and liquid aerosols.

In day to day language we often say mask, when referring to what are technically called respirators.

A respirator is a tight fitting mask that creates a facial seal. Each respirator when used properly will create a facial seal which will provide two way protection, filtering the air entering and exiting the wearer at a level of efficiency designated by the respirator or filter/cartridge (Half Face and Full Face). Key difference highlighted below:



Key Element	Respirators	Surgical Masks
Evaluation, Testing, and Certification	Respirators are evaluated, tested and certified by National Institute for Occupational Health and Safety (NIOSH) to meet set minimum performance requirements, including filter efficiency and breathing resistance. A NIOSH approved respirator will have the following text printed on the respirator: • NIOSH • the type of approval (e.g., N95), and • the manufacturer's name	Surgical mask manufacturers provide data and proposed claims to the Food and Drug Administration (FDA) in the United States of America for review. The FDA reviews data submitted by the manufacturer in comparison to other surgical masks already cleared by the FDA.
Purpose	Respirators protect from exposure to airborne particles. In healthcare, protects from exposure to biological aerosols including viruses and bacteria.	Surgical masks are a barrier to splashes, droplets, and spit.
Fit (Face seal)	Respirators are designed to seal tight to the face of the wearer. Wearers should be fit tested to make sure they are using the appropriate model and size of respirator to get the best fit.	Surgical masks are not designed to seal tight against the face.
Filtration	Respirator filters that collect at least 95% of the challenge aerosol are given a 95 rating. Those filters that collect at least 99% receive a “99” rating. And those that collect at least 99.97% (essentially 100%) receive a “100” rating. See the OSH Answers on Respiratory Protection Against Airborne Infectious Agents for Health Care Workers for more information about the N, R and P ratings.	Surgical masks do not effectively filter small particles from the air.
Use Limitations	Generally, single use. Should be discarded when it: • becomes damaged or deformed, • no longer forms an effective seal to the face, becomes wet or visibly dirty, • breathing through it becomes more difficult, or becomes contaminated with blood, respiratory or nasal secretions, or other bodily fluids. • Some types of respirators can be reused (e.g., elastomeric masks). Follow manufacturer’s instructions.	One time use (one patient encounter). Follow manufacturer’s instructions.

Source : National Institute for Occupational Safety and Health (NIOSH), 2016

Uses of Masks

- Masks are loose fitting, covering the nose and mouth
- Designed for one way protection, to capture bodily fluid leaving the wearer
- Example – worn during surgery to prevent coughing, sneezing, etc on the vulnerable patient
- Contrary to belief, masks are NOT designed to protect the wearer
- The vast majority of masks do not have a safety rating assigned to them (e.g. NIOSH or EN)

Uses of Respirators

- Respirators are tight fitting masks, designed to create a facial seal
- Non-valved respirators provide good two way protection, by filtering both inflow and outflow of air
- These are designed protect the wearer (when worn properly), up to the safety rating of the mask
- Available as disposable, half face or full face

Comparing N95 with FFP3 & FFP2

As per EN 149:2001, a given respiratory protective device can only be approved when the individual components satisfy. The requirements of the test specification which may be a complete standard or part of a standard, and practical performance tests have been carried out successfully on complete apparatus where specified in the appropriate standard. If for any reason a complete apparatus is not tested then simulation of the apparatus is permitted provided the respiratory characteristics and weight distribution are similar to those of the complete apparatus.

Europe uses two different standards. The “filtering face piece” score (FFP) comes from EN standard 149:2001. Then EN 143 standard covers P1/P2/P3 ratings. Both standards are maintained by CEN (European Committee for Standardization) although N95 rating is as per an American standard managed by NIOSH – part of the Center for Disease Control (CDC).

Particle filtering half masks are classified according to their filtering efficiency and their maximum total inward leakage. There are three classes of devices: FFP1, FFP2 and FFP3. The protection provided by an FFP2 - or FFP3 - device includes that provided by the device of lower class or classes. In addition, particle filtering half masks are classified as single shift use only or as re-usable (more than one shift)."

Filtration capacity of each type of respirator has been summarised below:

Respirator Standard	Filter Capacity (removes x% of all particles that are 0.3 microns in diameter or larger)
FFP1 & P1	At least 80%
FFP2 & P2	At least 94%
N95	At least 95%
N99 & FFP3	At least 99%
P3	At least 99.95%
N100	At least 99.97%

Designations

Particle filtering half masks meeting the requirements of this European Standard shall be designated in the following manner: Particle filtering half mask EN 149, year of publication, classification, option (where "D" is an option for a non-re-useable particle filtering half mask and mandatory for re-useable particle filtering half mask)."

For Example - Particle filtering half mask EN 149:2001 FFP1 NR D "As evident from the table that closest European equivalent to N95 are FFP2 / P2 rated respirators, which are rated at 94%, compared to the 95% of N95. Similarly, the closest to N100 are P3 rated respirators – with FFP3 following closely behind.

Valve Vs Non-valved Respirators

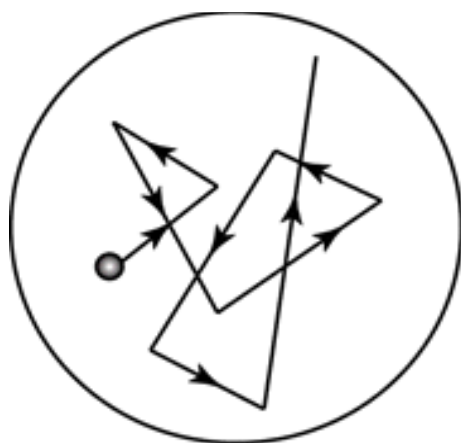
As per EN149:2001, A particle filtering half mask may have one or more exhalation valve(s), which shall function correctly in all orientations. If an exhalation valve is provided it shall be protected against or be resistant to dirt and mechanical damage and may be shrouded or may include any other device that may be necessary for the particle filtering half mask. Exhalation valve(s), if fitted, shall continue to operate correctly after a continuous exhalation flow of 300 l/min over a period of 30 s.

When the exhalation valve housing is attached to the face blank, it shall withstand axially a tensile force of 10 N applied for 10 s.



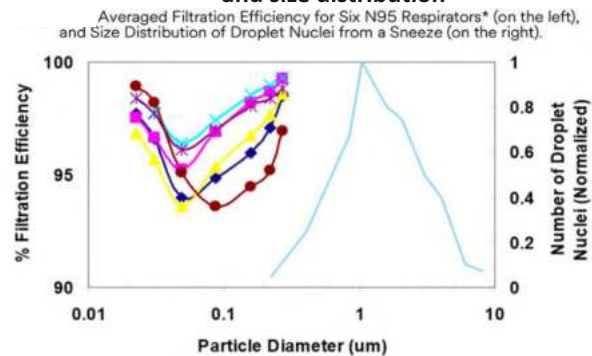
Valved respirators make it easier to exhale air. This makes them more comfortable to wear, and leads to less moisture build-up inside the respirator. Ideal for things like DIY/construction work. Although it is very much clear that in case of any infections, the same can easily be spread by the person wearing valved mask though respiration and exhaling through the valve where no filtration is done. The problem with valved respirators is that they do not filter the wearer's exhalation, only the inhale. This one-way protection puts others around the wearer at risk, in a situation like Covid-19. It's for this reason that hospitals and other medical practices do not use valved respirators. One hack to protect others when wearing a valved respirator is to put a surgical mask or "cloth face covering" over the valved respirator, to (partially) filter the out breath.

Respirators are measured by their efficiency at filtering particles of 0.3 microns and bigger (noting that the coronavirus is smaller than that). The reason for the focus on 0.3 microns is because it is the "most penetrating particle size" (MPPS). Particles above this size move in ways we might anticipate, and will get trapped in a filter with gaps smaller than the particle size. Particles smaller than 0.3 microns exhibit what's called Brownian motion – which makes them easier to filter. Brownian motion refers to a phenomenon whereby the particle's mass is small enough that it no longer travels unimpeded through the air. Instead it interacts with the molecules in the air (nitrogen, oxygen, etc), causing it to pinball between them, moving in an erratic pattern. According to researchers this point between "normal" motion and Brownian motion is the hardest particle size for filters to capture. What we can take away from this, is that high filter efficiency at 0.3 micron size will generally translate to high filter efficiency below this size also.



Brownian Motion

Filteration efficiency of various N95 Respirators and size distribution



There are a number of possible risks with respirators that it's worth being aware of, so that you can avoid making them.

1. **Not fitting and wearing respirators correctly** – A respirator can't fully protect you if it doesn't fit your face.
2. **Touching the front of the respirator** (which catches viruses etc) and then transferring that to other objects, which could eventually lead back to your mouth and nose.
3. **Taking unnecessary exposure risks** because you're wearing a respirator. Don't let it give you false confidence. The safest thing is maintaining social distance.

Surgical Masks

A surgical mask is a loose-fitting, disposable device that creates a physical barrier between the mouth and nose of the wearer and potential contaminants in the immediate environment. Surgical masks are regulated under 21 CFR 878.4040. Surgical masks are not to be shared and may be labeled as surgical, isolation, dental, or medical procedure masks. They may come with or without a face shield. These are often referred to as face masks, although not all face masks are regulated as surgical masks.

Surgical masks are made in different thicknesses and with different ability to protect you from contact with liquids. These properties may also affect how easily you can breathe through the face mask and how well the surgical mask protects you. If worn properly, a surgical mask is meant to help block large-particle droplets, splashes, sprays, or splatter that may contain germs (viruses and bacteria), keeping it from reaching your mouth and nose. Surgical masks may also help reduce exposure of your saliva and respiratory secretions to others. While a surgical mask may be effective in blocking splashes and large-particle droplets, a face mask, by design, does not filter or block very small particles in the air that may

be transmitted by coughs, sneezes, or certain medical procedures.

Surgical masks also do not provide complete protection from germs and other contaminants because of the loose fit between the surface of the mask and your face. Surgical masks are not intended to be used more than once. If your mask is damaged or soiled, or if breathing through the mask becomes difficult, you should remove the face mask, discard it safely, and replace it with a new one. To safely discard your mask, place it in a plastic bag and put it in the trash. Wash your hands after handling the used mask.

Surgical masks are generally speaking a 3-ply (three layer) design, with 2 sheets of “non-woven” fabric sandwiching a “melt-blown” layer in the middle. It's the melt-blown layer that provides the filtering capability. A melt-blown material is also used in respirators, and thus you can imagine it's more expensive and hard to come by recently, due to demand.

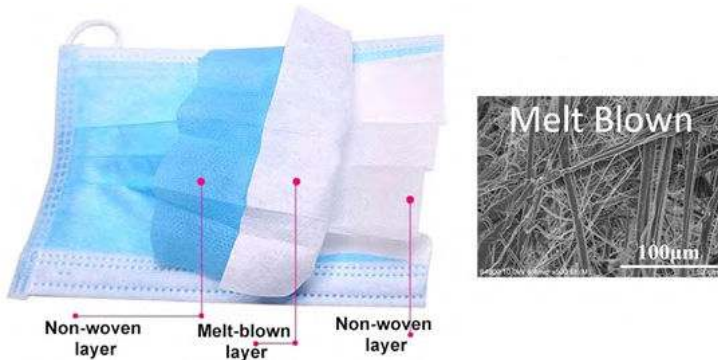


Image of the melt-blown filaments under microscope come from mdpi.com. The melt-blown fabric is made by melting a plastic, then blowing it from either side at high velocity onto a rotating barrel. Done right, this results in a fabric composed of tiny filaments.

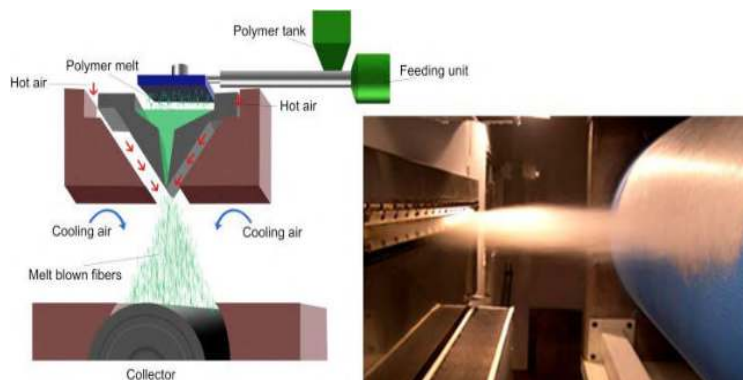


Diagram of melt-blown machinery (left) comes from Erdem Ramazan's book, and the image of melt-blowing in progress (right) comes from 4FFF on wikipedia.

It is therefore compulsory that particular requirement or need be properly identified /understood prior to using any kind of masks or respirators. Selection of masks and respirators must be done based on desired protection from

specific aerosol/dust and the level of same to have adequate protection from the prevailing hazards. Not all melt blown fabric has the same filtering capability, some are better than others. Unfortunately we can't test the filtering capability of the melt-blown layer without specialized knowledge and equipment. What we can do, however, is at least check that the melt-blown layer is present.

Below Figure show an example of a surgical mask (left) that came without the melt-blown layer. You can imagine that, given the extra cost and current scarcity of melt-blown fabrics, manufacturers might cut corners with this layer, so it's worth keeping an eye on.



Choosing surgical masks that have been tested according to a set of standardized test methods (ASTM F2100, EN 14683, or equivalent) will help avoid low quality products. The ASTM standard for surgical masks (particularly levels 2 & 3) are primarily focused around fluid resistance during surgery. These higher levels don't offer much extra in the way of protection from Covid-19 under non-surgical conditions.

It is therefore compulsory that particular requirement or need be properly identified /understood prior to using any kind of masks or respirators. Selection of masks and respirators must be done based on desired protection from specific aerosol/dust and the level of same to have adequate protection from the prevailing hazards.



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CRITICAL QUESTIONS ON COVID19 AND MANAGEMENT OF BEHAVIOURAL SAFETY INTERVENTIONS: INDIA CASE STUDY

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Abstract

In the Covid19 scenario, it is very critical for everyone to redefine what is safe behaviour and spot-correct it for safety of self and others. This article addresses some behavioural safety aspects of Covid19 in terms of why do people take risks as they do?, what are the similarities and differences between Covid19 and behavioral based safety (BBS) management as both interventions are driving behavioural change?, how to implement BBS after lockdown in plant, and behavioral challenges and solutions to contain Covid19. This paper is based on qualitative methodology using interviews, group discussions, field surveys. Objective is to review the current conditions and enable people to access this researched information for effective management of behavioural safety interventions. Implications are discussed in view of our safety cultural background in India. Keywords: Covid19 Questions, behavioural safety, culture, India

Introduction

Covid19 impacted all countries, this article is about India's behavioural safety culture among its huge population. Behaviour based safety (BBS) is a culture of caring for people around to ensure "0" harm. Whereas, safety is not in our behaviors in our cultural context, and don't even think that due to COVID-19, safety would stay in our behaviors, we have got it temporary in our behaviors, until it is emphasized on continuous basis, these Covid19 at-risk behaviors would reemerge, and it would become a threat to our human resources and economy of our country again. According to WHO (2020), one of the most critical elements of reducing this virus transmission is behaviour of people. During this scenario, to combat Covid19 permanently, the governments (alongwith public private partnerships in all states) are trying harder to engage citizens and businesses of the country toward health and safety behaviors and mind sets. What is most compelling today is to engaging human mind with the work during lockdowns. The government, the workforce and managements are finding ways in this direction through brainstorming discussions, so that the economy can come back on track in all countries (ILO, 2020).

Covid19 outbreak has changed our approach toward workplace safety, health and environment (EU-OSHA, 2020). Although, robust plant design, engineering controls, SOPs, organizational safety structure are essential but ineffective without behavioural safety aspects of HSE systems. Also, there is a need to understand that in present conditions, the businesses that are going to survive are

those whose health, safety and environment (HSE) systems are behavior-based, and are not merely reflected in documentation. The business leaders of the country must underline this that further the business journey is focused on safe behaviours involving people from top to bottom. The leaders must see through these changes in ways that gain and maintain the trust of their people (Accenture, 2020). Covid19 posed another major challenge that people are finding harder to adjust and internalize new behaviors expected during lock down. Human minds are hard-wired. Imbibing new behaviors such as distancing etc. takes much time for most people, as because behaviors are rooted in cultures. BBS as an application of behavioural science precautions that any unsafe/ at-risk behaviour at any place by anyone would certainly lead to incidents and illnesses.

Objective

Behavioural safety approach is a training methodology to emotionally sensitize and empathize all including top leaders towards inculcating an interdependent safety culture. An objective of this article is to review the current conditions of Covid19 for effective management of behavioural safety interventions and enable people to access this researched information. In India, BBS is also referred as Bharat Bane Surkshit (Nation becomes safe), of which the responsibility lies on the shoulders of all corporates and citizens by implementing BBS and saving human life from incidents/illnesses.

Methodology

This paper, is based on the qualitative methods using personal interviews, group discussions, and field surveys. This study is part of an ongoing interdisciplinary intervention of behavioural science, management and industrial safety disciplines, which is national longitudinal action survey in India. For this research paper, a total of about 1000 persons were approached through remote data collection techniques. These research participants had already implemented behavioral safety at their sites. The research participants included, the CEO, Directors, managers, heads of departments, safety professionals belonging to the public and private industrial sectors such as chemicals, construction, gas, power, and steel across Indian locations. Their responses to the Covid19 related questions were collated and thematic data analysis was used to reflect the findings. Interestingly, as part of this action survey, the participating organizations also started implementing Covid19 related new behaviors at sites.

Results and Findings

This research explored the following critical behavioural safety aspects of Covid19. These arguments and the logic underlying would help develop some key areas for interdependent behavioural safety culture advancement.

Research Statement 1

Why do people take risks as they do?

Psychologically, people don't change with a change in safety definitions, which introduces risk into their life. Also people define safety differently for others from themselves, and gap remains narrow between compliance and compromise at work, road or work situations. Risk-taking behaviors vary among people, cultures and countries. Risk perception of Covid19 is based on risk consequences being felt as immediately visible, which is not. Hence people keep taking risk. Also the risk perceptions depend upon the antecedents, the social realm and cultural backgrounds of people (Jens, 2019). According to Susan Michie (2020), given differences in behaviours and their contexts, the factors maintaining them differ as do the ways of changing them. As a citizen, when we don't follow safety practices in general on daily basis, our risk perception remains low. Moreover, we don't conduct new safe behaviours (social/physical distancing, wearing face mask, hands hygiene, etc.) as they are not in our cultural background. As soon as, the lockdown enforcement is relaxed, we come back to our old behavioural patterns, possibilities of Covid19 spread exist and our risk-taking behaviors remain high. In order

to prevent or circumvent this, we need to spread safety messages through multiple ways such as media, government, motivational speeches on continuous basis. Behavior based approaches are long term interventions to contain HSE (health, safety, environment) risks. The lockdown enforcement, political thought process etc. are temporary and short-term responses to these pandemics. Hence, the managements ought to prepare accordingly.

We need to think even beyond vaccine for Covid19, as our most critical action is needed to contain the spread of the health risks through behavioural safety initiatives and interventions across all levels, areas and sectors in the country. We are at cross roads, today issue is not only tackling the Covid19, but to address and reinforce the overall safety culture as a national agenda of the governments as planned interventions for saving human life before the incidents. Henceforth, we need to adopt the new set of these desired behaviors as a SOP and work-life styles to say goodbye to such risks. It is time to reflect on our company's cultural values (Berman and Thurkow, 2020).

A most critical question remains, would lockdown exit mean that we exit the risk of Covid19? Post-lockdown is more critical period when people are less alert about the risk exposure. The answer lies within everyone that how we handle post-lockdown risks around, when we go out, whom do we meet, etc. Thus being careful and alert or not would render everyone safe or unsafe. According to Cloete (2020), much of the expected impact originates from behaviour and lifestyle changes. Lockdown essentially introduces a slowdown in everyone's life. Hence, adjusting to slower life conditions as compared to the faster life styles would take time.

Another vital question or at-risk behavior is why certain groups of people are not cooperating in fighting Covid19 despite government's support and resources being made available. Is it because they have not internalized safe behaviours yet, or not understood the consequences of this disease. That's one reason that the chain of Covid19 is not being broken. How to achieve over this behavioral aspect is critical. Is it because the crisis have increased in personal, professional and economic life of vulnerable section of society? Cricket stars urged that the country can be successful in its fight against Covid-19 only if people cooperate (India Today,

2020). It seems that these people are still following the pre-covid19 unsafe behaviors as contextualized in their cultural practices. Un-risking the present context would require sustainable and focused efforts along with Covid19 implications and impact on human lives. Hence, Covid19 fatalities would continue till people adopt a required culture of safe behaviours.

Research Statement 2

What are the similarities and differences between Covid19 and behavioral based safety management, as both interventions are driving behavioural change?

People normally take at least 2-3 weeks to understand and adapt to the new behavioural changes expected in a new environment such as lockdown in the context of large public of a nation. Some deviations to these new behaviors may appear and reappear for few weeks till people adjust and self-control, irrespective of a place/country, and we deal with the implications thereof, and keep innovating/developing new solutions. We come across similar deviations while implementing behavior based safety at industry sites.

Secondly, when could we say that a zero number of people who have Covid19 is achieved? What are its implications and solutions. It would depend, not only on lockdown enforcement, mass education and awareness, social / physical distancing, motivational speeches, economic relief packages but also on continuous identification of cases through testing, re-testing, quarantining, monitoring, treatment, innovation etc. as a long term perspective. Any such country-wide or global multilevel socio-medicoeconomic-behavioral intervention requires rigorous follow ups throughout for a year or so, failing which the chances of relapse/reoccurrence are equally high. We need to be ready for its long-time implications and solutions of any such pandemic social health issue. In brief, such interventions have to become a part of the existing safety health environment (SHE) management style in order to avoid relapse and achieve zero-coronavirus case or zero at-risk behavior at sites.

What are the similarities and differences between Covid19 and BBS management, as both are driving behavioural change? Negligence of both can cause havoc. Both can be controlled through behaviour. To save humanity, we need to focus on our behaviour which alone will ensure our victory in this hour of peril. BBS management and Covid19 management seem to be similar. For Covid19:

1. Make him aware about Covid 19;
2. Educate him why precautions are necessary;

3. Tell him what is the risk;
4. Ask him what is missing;
5. Take promise that he will follow throughout;
6. Thank him.

Both Covid19 and BBS can lead to high severity if not corrected by taking adequate precautions in terms of behaviour (self as well as others), here everyone's safety is interdependent. Another similarity is both are observable, measurable, implementable and curable. If Government wants, it can implement HSE systems. All behavioral changes will take place. We have seen harsh punishment like police beating the violators but it was appreciated and supported by everybody including media. When safety professional advice management to take action against violators, they find excuses to save them. Now the government is implementing all safety measures, not the safety professional. But, on the contrary, as seen in past few decades, the safety enforcement in industry is poor by <30%. That is why, precisely, the behavioural implementation is recommended in all world safety standards (Kaila, 2019).

A similarity between Covid19 and BBS is that we care for each other. Both leading to positive, sustainable, environment friendly behaviour among human, whereas BBS management nurtured through harmonious and cohesive way, Covid-19 pandemic is working through fearbased approach which is opposite to BBS. According to an executive director of India Glycols, an application of BBS is the need of the hour. Wearing PPEs and staying at home are very much the desired behavioural aspects. During Covid19, the Police have become the observers and they also need BBS training. Of course, there are exceptions with some police people trying to counsel the public in a positive way. In many cases, they are not polite and many among the public also don't understand being polite, despite advices from leaders, celebrities and media. Patience and politeness are keys of any behavioral change intervention. Moreover, control by oneself (self-observation of social distancing, face mask etc.) in community sites is very crucial for one's own health and safety, when one is not certain about infection spread from another.

Level of Management of Safety Risks are:

1. Reactive safety,
2. Dependent safety,

3. Independent safety,
4. Interdependent safety.

In Covid19, we are almost operating at level 1 & 2. We have reacted to the situation proactively and now dependent on the governments actions for our citizen's safety. Example, till the time, we are dependent on parents, we keep committing mistakes, as soon as we become independent, our behavioural alertness is increased/ multiplied. If we wish to go to level 3 & 4, then we need to open/exit lockdowns, everyone is supposed to manage the personal risk on his/her own. We need to understand here that our behavioural alertness is highest; when risk is known/well-defined. For example, we are at high risk during daily morning/evening's city peak traffic time, and we are highly alert at that time for road driving behaviors knowing the risks involved. Presently, in Covid19, we reached a situation when everyone is aware of risks. You are aware, you need to be alert and alert others as well.

Also, an enforcement for face masks and physical distancing is not relaxed in level 3 & 4. It is considered a violation if people don't wear PPE or maintain social distance at all places, etc. Companies also thought of a new better safety idea during this Corona virus lockdown time that would be practiced in the times ahead at sites.

The responses included:

1. our management took benefit of e-learning during this lockdown period. We arranged audio conference for further action on safety implementation.
2. We started comprehensive training program on BBS for the workers who are residing in company premises. We have trained two of them through video conferencing and assign them to train all other workers. By doing this, we have engaged all of them for 4 hrs. This is also helping to get rid off from anxiety. We are maintaining 100% social distancing on daily basis.
3. prepare in time, we started temperatures scanning from 12th February 2020.
4. Using a device to proactively ensure deenergisation of electrical equipment in addition to conventional LOTO (lockout tagout) to eliminate human intervention, using AI (artificial intelligence) to enhance safety.

Research Statement 3

How to implement BBS during/after Lock down in plants?

"Safety" whose responsibility, is a million dollars question that remains unresolved, therefore causing a global concern. If safety is everyone's responsibility, then why it is not being done. That means something is lacking in the learning, values, culture of the person which needs

attention and reinforcement by focusing on which can save us million dollars and lives of people as well. On this, we need to consider some aspects as below.

- a. We need to add a New Behavioral Category "Lockdown Behaviors" in BBS observation checklist and communicate to all employees through different media for implementation at site.
- b. Each area incharge must conduct daily small group TBT (tool box talk) to convey the principles of lockdown (social/ physical distancing, face mask, no spitting, hand hygiene, etc.) while observing and spot-correction of atrisk behaviors.
- c. Each area incharge must Display Sign-boards at all respective areas/entry/exit etc. as below in English / Hindi Maintain Safe Distance, Keep Wearing Face Mask, Follow Queue at entry/exit, Don't Touch Surfaces, Request each other to do so if they don't, Convey all the above on Public Address System (PAS)
- d. Occupational Health Centers (OHC) must conduct random medical/COVID19 specific tests for further actions. All employees entering should be checked at the gate with infra-red thermal cameras for fever.
- e. This is the time when all Safety, Health and Environment (SHE) teams must coordinate actively for behavioural implementation of procedures and guidelines through departments.
- f. There are similarities between BBS and lockdown implementation as both are people-based and behavior based. This is an opportunity to strengthen BBS further at sites.

HSE Vice President of Dorf Ketal company said, "we made the changes accordingly and advised all BBS observers at sites to do observations/spot corrections accordingly as mentioned above". This indicates the role of leadership guidance/thrust all over in all organizations. A safety head said, "power plant being essential services is continuously in operation and uninterrupted electricity is provided while ensuring all required safety precaution to prevent COVID 19.

Organizations need to provide feedback to all employees every single day using multiple communication channels to keep people informed about the company's responses to the crisis (Cooper, 2020). According to a Director of DCM Shriram, these are the thoughts and actions in order to change the post-Covid behaviours to prevent further spread and resuming operations safely.

Above all, this is the high time that each citizen, each employee plays the role of safety catalyst in promoting interdependent safety culture everywhere. Governments alone cannot achieve zero number of people who have Covid19. Sooner the better for society that the public and each person understands this significant role in critical times in favour of human race by contributing safe behaviours each day. Be an active observer.

A focused group discussion came up with concerns/ insights as follows:

1. Managing plant safety with 1/3 of limited manpower is challenging;
2. Migrant labourers have gone back, taking work from new workmen is a challenge;
3. People at plant are much more conscious of safety due to COVID-19;
4. Unknowingly, organizations have started practicing interdependent safety culture which created positive vibrations. People are extra-cautious if someone is behaving unsafe;
5. Managements are saying to employees, instead of creating panic, develop extra-cautions;
6. Let the workmen develop immunity by giving them more nutritional foods, so that they can fight with infection;
7. Employees shouldn't get the feeling that their safety depends upon management, rather they should care for each other;
8. Covid19 would encourage plants to manage safety more by automation, design and engineering controls to manage social distancing etc;
9. Behavioural safety is a top down policy emphasis, and bottom-up reinforcement and practicing of safe behaviours is key to success of BBS;
10. Migrant labourers' fear of coronavirus rendered them move to their native places. But nearly 2 months of joblessness rendered them living without appropriate food which would have caused them reduced immunity. So it is a management concern to increase their immunity levels when they are engaged;
11. Middle managements are also challenged to implement safety procedures to their workers;
12. At times, when social distancing is difficult, facemask and face shield are compulsory to reduce exposure to infection;
13. Trust of workers has to be revoked and communicated for their job security and safety;

Research Statement 4

What are the Behavioural Challenges and Solutions?

Covid19 is long tunnel, may be endemic. Act early and get prepared. Initiate the change and see that it gets larger and sustain. Everyone is aware and unaware of his as well as other's safe/ unsafe behaviors. Moreover, everyone needs correction as well as can contribute towards behavioural changes in others.

According to Betsch, et al. (2020), behavioural insights for COVID-19 are of critical importance. Behavior remains a challenge for safety implementations. Hence regulated training, retraining, monitoring, measurement, rewarding, should continue by respective area-incharges. Some challenges are:

1. Fear and Stress: everyone is feeling low these days with Covid19. Keep listening and talking to people. Keep environment positive. Personal/ group counselling is right approach that would keep organizational morale up.
2. How to mobilize people to be safe: continuously engaging people mentally through mass communications helps to mobilize them for behaving safe. For example, in Mumbai local trains, people travelled on rooftops of electric trains due to overcrowding. Everyday a couple of persons died. Then the Railways decided to communicate in every local train every 3 minute through public address system, that "the overhead wires are flowing with 20,000 volts, traveling on rooftop of trains is deadly". This communication went on for year by year. Today we don't see such fatalities in Mumbai public trains.
3. Maintaining peace of mind during free non-work times has become real difficult for most people. Some people are mature enough to maintain their emotional balance by engaging in yoga, meditation, new learning, pursuing hobbies, writing, reconnecting with old friends etc.
4. How to be creatively joyful during non-work times: unroutine your activities, unknot your daily practice, do what you don't do, engage in new thoughts and actions, but all this within Covid19 laid down rules. This would reenergize yourself and remove boredom in non-work situations.
5. What challenges further are: because of unavailability of sufficient testing kit (resources), only limited testing per day is possible, our media should give a positive news who came out from Covid19 (praise is more required to motivate and courage for others), and still people take it easy due to lack of knowledge and not sincere and serious.

6. How to get difficult persons engage in safe behaviours is a major challenge. Peer-based approach in respective areas seems workable as people are known and acceptable to each other, and the local leaders (Panchayats) are influential to facilitate safe behaviours in present times of Covid19 which was initiated on video conferencing on 24th April 2020 by Mr. Narendra Modi, our Hon'ble Prime Minister.

Human safety is a pure service of humanity to save human lives. Some Indian companies organized Covid19 behaviors awareness drive as follows:

रोको , टोकोऔरसुधारों!! involving all HODs, Section Incharge, EHS Leader, Task Force Team Members, Covid-19 Audit Team, Safety Team and Security Team; and began an awareness drive (fig. 1) on the BBS theme "Roko, Toko aur Sudharo" for following points:

- | | |
|---|-----------------------|
| 1. Proper PPEs | 2. Social Distancing |
| 3. Face Cover | 4. Spitting on Ground |
| 5. Use of Mobile Phone | 6. Road Safety |
| 7. Tobacco Chewing and Smoking in Plant | 8. Hand Sanitization |

BBS= Baar Baar Samajhao



Fig. 1: Covid19 Behavioral Awareness Drive (C-BAD)

A safety group experts expressed that the plants should thoroughly examine their facilities, carry out pre-start up safety checks and ensure availability of emergency resources, before restarting facilities after long shut down.

The questions still that need to be answered are: How can Technology and Artificial Intelligence help in improving safe behaviour at workplace? What is the Covid19 policy? Another challenge in legal compliance - it may go in back burners? How to remove fear from workmen during working at workplace? How to maintain social distancing

during construction? What is practical immunity improvement method?

Research Statement 5

Despite testing, tracing, and tracking, Covid19 is spreading. Can we say that this spreading chain is behavioural in nature, how do we break it?

Yes, this chain begins from one to another, and one to many, knowingly or unknowingly, and hence logically, truly behavioural in its nature. As in BBS implementation, we train and involve many observers to spot-correct at-risk behaviors, similarly we need to create a chain of behavioural safety active observers and mentors (such as social and community workers, etc.) in each area and location who will keep an observation like a targeted missile to fight its objectives. Keep multiplying such observers to increase speed of breaking the Covid19 spreading chain. Observers need appreciation of HODs to continue doing observation/spot-correction. This is to be followed across the nation. This dedicated chain of observers would break chain of Covid19 spreading in communities by observing and spot-correction of Covid19 spreading chain. Police and political workers should be avoided in this approach as they often use negative approach (fear, compulsion, threat). It is a people-driven support framework like a tested behavioural science BBS approach. COVID-19 pandemic can be brought under control by massive and rapid behaviour change. To achieve this we need to systematically monitor how different individuals perceive risk and what prompts them to act upon it (Betsch, 2020).

An Executive Director of ONGC said, "human being today, can live in 100 % isolation. Complete isolation is must for stopping the spread of Covid. So success rate is function of isolation effectiveness. So it is chain of behavioral patterns of socioeconomic strata. According to a senior manager at Tata projects, "prevention by social/ physical distancing is the only solution". A safety professional of GAIL stated that there is a immediate need of developing local contingency plan in small pockets. Like all societies, muhallas (old settings) should prepare contingency plan and which should be led by one expert. Be it sanitisation etc. and all proactive measures, and there should be proper planning for action in case there is case of Covid19. Proper plan should include post planning after recovery stage. There should be some special team for controlling psychological effect also. Top most thing is that people should be

disciplined and obey the directions given by the team". As per opinion of a HSE Manager of DorfKetal: spreading chain is more due to behaviours and reasons such as Overconfidence, Lack of awareness about consequences, Inadequate precautions, Improper communication, and Lack of resources in terms of adequacy and accuracy of testing.

It is an environment that makes people perform, management empowers them to perform, and BBS Implementation drives the behavioural culture/environment. Covid19 is indeed a behavioral issue. The administration/police need to be trained on this matter. Also, media, celebrities and prominent personalities to constantly address the public. Politicians may not be doing enough. According to a CEO of chemical plants, more symptomatic testing by Government is needed, asymptomatic private testing to be made mandatory for running establishments, post-lockdown only alternate is 50% attendance allowance to ensure physical distancing, and for Red & Hot Zones, the restrictions should continue as Covid19 persons increased.

According to a safety manager at Hiranandani Constructions, "the identified hotspots are sealed by local police CRPF and other means, so no civilian ever are allowed outside, thus now the number of Covid 19 persons rose due to emergency services personnel like, 1. Police, 2. CRPF, 3. Municipality workers, 4. Doctor, Nurses, 5. Ambulance drivers, Medicine vehicle drivers and other emergency material transport drivers, 6. News Reporters, Cameramen, photographer, 7. Other emergency aids servants and shop keepers.

- However list of above personnel to be prepared for each Hotspot management. They must be separated from their respective families to break the chain.
- If possible PPE Kit to be distributed to all these group of personnel, not only for hospital personnel, in order to restrict such person from infection of Covid19 virus.
- Now focus on the people who live in the Hotspot areas: categorize their requirements to safe supply chain management. Complete lock down for people living inside hotspot.
- The areas like Dharavi (a biggest slum in Asia) where people have to use common toilets and bathrooms should be provided with temporary latrine facility which can be accommodated in the room only by small partition. In India, most numbers of Covid19 positives came from densely populated areas as TV channels reported.
- One important thing via public address system, people should be made aware that they shall not take fever

tablets on their own so that early identification of this virus may be possible". A veteran safety professional said, "the only way is to wear mask and don't touch anywhere outside your home. People are not following this, hence Covid19 is spreading".

Implications

Ironically, a safety expert admitted that Covid19 is a natural course of pandemic in the sense that the water, noise, air pollutions were found much lower than before during lockdowns. With Covid19, BBS intervention spreads from industry to country, and people became more safety-minded than before. But unexpectedly, the state government's low concern for life safety of large numbers of contractual labour is reflected during lockdown for transportation to their hometowns, and they were forced to walk hundreds of miles.

While there is much we cannot control with COVID-19, there are specific behaviors that will reduce the risk of viral exposure for ourselves, our co-workers, and our communities. Decades of research show the power of behavioral science in increasing the consistency of safe behaviors. The spread of COVID-19 serves as an important reminder of what organizations can gain by incorporating a behavioral component into a comprehensive exposure reduction process. The behavioural science principles and an approach toward change implementation drive is almost similar for both community and organizations. One is captive and another is an open situation.

Behaviors are rooted and wired in cultures. We, in India, have not emphasized safety behaviors in our culture and many a times, unsafe behaviors are justified. That's the prime reason that it's becoming so hard to break the Covid19 spreading. All countries witness today that how difficult it is to sell the value of safety to its own citizens. In this regard, behavioural reinforcements are the major factor to ensure that people are adopting new behaviors related to COVID-19. People will take shortcuts and violate. Active observers will not fail to spot-correct such at-risk behaviors, be it anywhere, at workplace or public place, or residence. A safety manager said, "we at Agrocel company, started spot-correction and employees are spreading the message to each other to follow COVID19 precautions. Companies develop a faith in behavioral safety programs and gradually, it becomes their corporate value and culture.

According to a senior safety professional from DCM Shriram, main reasons that actually increased the number of people who have Covid19 included: lack of risk anticipation due to Covid19, "If it had not happened to me till date it will never happen to me as I am immune, false sense of mental immunity. It's similar to typical safety mindset. I am working here in this plant for last 25 years, never ever got injured nor see any hazard here which poses high risk. Do not see others carrying corona/suspected patients as risk. Till Covid19, wearing of face mask and social/ physical distancing is included in BBS checklist". He added further, "This is purely behaviour of maintaining safe physical/social distancing (SD) in true sense and just not for name sake. I know many essential services/industries are being operated without any SD compliance that makes entire effort futile. This is similar to at-risk behaviours at work place which can cause serious accidents if not corrected. Same is the case here too".

An ex-executive director of India Glycols stated that the steps mentioned below would have helped or lack of them was the cause of spread of Covid19 in India. 1. We were a bit late in anticipating what was coming. Lockdown should have been announced in the first week of March 2020. 2. Monitoring activities and prompt actions. 3. Applying BBS, especially by police/ admin, for a better public response. 4. Quickly Creating more hospitals through makeshift arrangements (say, by converting gymnasiums, convention halls etc. to hospitals). 5. Promptly procuring/ distributing PPEs and testing kits for identification and containing the spread. 6. Allowing vendors to deliver essential items at door steps while closely monitoring the health of these distributors. Inviting volunteers and poor people (on payment basis) facilitate this distribution. This would have avoided more people rushing to shops. 7. Overall monitoring of people movement through more drones. 8. Donations were prominently by Centre only (through PM Cares) and not by states. There was perhaps more potential for contributions from willing public to help this cause.

Our speed of decision-making based on accurate data as well as actions determine what we achieve in managing the risks and their consequences. In India, we lacked in speed of decision making, and timely management of above mentioned points. There were attacks on people, police, media and medical personnel during Covid19 times, which posed a greater and scary challenge to government, corporates and everyone else. Also, in India, people normally need many reminders to change for safe behaviours as compared to New Zealand or Australian countries. That's the prime reason, breaking the chain of Covid19 spreading becomes so difficult. At personal levels,

we all need to gradually develop our will and determination to stay with our safe behaviours which would balance our lives from at risk behaviors and environments.

This is a period of change/challenge for human race. Stress, anxiety, irritability, fear are experiences of adjusting to new behaviors during Covid19 (Hoof, 2020). People would explore new definitions of their own behavioral safety. People have to deal with their own cognitive confusions. It would be surely a long-term affair. Employees would need to brainstorm for new work formats in order to avoid Covid19. According to the Chairman, Maruti Suzuki, the key for us is to prepare workers with many health and safety measures that are here to stay (Business Standard, 2020). Covid19 pushed corporates to implement HSE measures more seriously than before.

According to safety practitioners, we have to live with this now like other diseases, early we accept, better it would be. Probably, the human beings would learn to live with certain viruses with more safety precautions as we progress to deal with or without Covid19. Behaviour and attitude are the reason for increasing Covid19 cases across the globe. Hope post-Covid mindset of people would be positively different in terms of their spiritual insights, re-balancing personenvironment-fit, compassion, tolerance, adjustment, understanding, patience, and so on. Pray, All be safe. Don't get scared, rather resolve it. Share motivational positive messages of strong determination to fight and break Covid19 spreading chain (WHO, 2020). A senior psychologist said, "develop immunity system by right lifestyle and keep high quality hygiene in regular behaviour".

Human life is more valuable than the business or economy. So, let the countries understand clearly that lockdown exits in particular places are logical only when the number of Covid19 persons have significantly decreased. Till then, let the businesses be allowed with minimum workforce, online, work from home or another innovative formats. In India especially, the spread of Covid19 persons has taken a complicated political, religious, socio-cultural, communal base (Muftin and Muhsin, 2020). Some opposition parties made it difficult instead of being a support in this human cause. For various reasons, people have been hiding that they have Covid19 which increased the incidence of this problem multifold. As a result of which, the Covid19 spreading chain could not be broken. Hence, most strict

measures are needed by our central/state governments as soon as possible failing which the problem is likely to get further intensified.

Covid19 challenged everyone for re-survival, and we are challenged for, what we can achieve! A plant manager said, "for survival, boost our immunity through, positive thinking, take care of hygiene, healthy diet, listen good music, pray to god". According to a HSE general manager, "It will teach human beings many things like: how to survive in worst situation, what is real nature, to become closer to your own family, importance of PPE, the learnings from our Honourable Prime Minister's leadership action/reaction/calmness and the way he handles each one of us".

Certain indirect behavioural implications of Covid19 are also likely to emerge. Hugging (as against physical distancing, reflection of human bonding that people use in many cultures across the globe), it seems Covid19 would take that away from human race, or people would be afraid of. Similarly, handshaking an expression of human touch may become a thing of the past. Globally, Covid19 has also become the reason for cold war between China and many countries that are severely affected by Chinese virus as it is called by the American President. Most affected countries are against China as Covid19 cropped up there and spreaded in globe (Awasthi, 2020).

Behavioural revolution is needed which means a change into a set of safe behaviours to contain Covid19 and break its chain from spreading further. How is it possible or is it too much to expect from everyone in the country? How to revolutionize safe behaviors to combat Covid19 before losing more lives? This Covid19 has made people, industry and the nation more alert and safe than before. People are taking care of each other, the rich of the poor, the strong of the weaker, and the educated of not so educated. People across the globe would have better sense of their personal health, safety and environment due to COVID-19 experiences that came with lots of pain and hurt. Business leaders would be more alert for HSE systems in their organizations. Hence this behavioral revolution would thrive nations economically safer and stronger than before (Biswal, 2020). Sadly, Covid19 is the hardest way of teaching safety to the mankind. In present conditions, the safe behaviours are well defined, only option is to follow them or get badly hurt which stands true for companies or communities across the globe. The governments have set safety procedures and also reinforcing them. Unfortunately, people would surely face consequences if these are not followed. An individual safety is personal responsibility. However, Countries/corporates would not give up till the safety culture is evolved and followed by

people.

A big challenge of Covid19 is that people are not able to maintain physical distancing as because it has never been part of their culture (fig.2). Culture drives the behaviors. They need observers to correct them on-the-spot repeatedly. In present times of Covid19, the same thing is happening that all of us, subconsciously are not maintaining physical distancing, be it media person, doctors, police. Everyone is getting affected. Same behaviors would repeat at work sites as well. We can't observe ourselves, but we can observe others. Hence make it a point of spot-correction for everyone daily. Announce it every hour on public address system whether people are observing their co-workers around and correcting on-the-spot. One observation a day, keep the risk away. Make safety observations a part of an individual performance at sites. Observations help save lives. Leaders need to get focused on it for safety of their human resources and business, as because safety is compromised when safety is under pressures of production and profit by seniors. Safety culture is a function of leadership initiatives and employees/workmen/everyone involvement on continuing basis. Also, it boils down to the family safety cultures which vary across cities, districts, etc. Some families are more safety conscious than others. Moreover, people have taken Covid19 non-seriously. In India, people are roaming around in spite of the lockdowns being extended. Safety seems far away from their actions. That's why Covid19 positive numbers have increased. People don't understand safety being idle without working. Especially, in a cosmopolitan nature of city Mumbai, people understand safety while working. People get driven by predominant work motives.



Fig 2 Lack of social distancing during lockdown

Now largely people, right upto the villages, are much aware about the risks associated with Covid19. Now people are supposed to maintain physical distancing etc., which they didn't do earlier. The difficulty is balancing between old and new behaviors of following physical distancing, wearing mask, hand washing. Hence when they maintain these behaviors,

they will sometimes go back to original behaviors, which would pose greater risk to everyone around. It is not easy for people to adopt new behaviors, they do what they see around most of times. Monkeys see, monkeys do. Thus, imbibing new behaviors is a gradual process, which essentially requires continuous monitoring and handholding by corporates and communities. People intend to remain non-compliant toward a new set of behaviors as they perceive it to be a temporary phenomenon. More importantly, people need to be alerted repeatedly by observers around whenever they engage in any such at-risk behaviors. It all depends upon how an aware person or observer effectively conveys the risk to the less aware for his/her safe behaviour and spot-correction, which is called a risk based conversation (RBC). Citizens ought to observe and save each other, this is an essence of behaviour safety approach. Because, this is the time when the governments have taken lots of measures and Covid19 numbers are still rising. Public cooperation is low as rising Covid19 numbers lead us to say that the people are violating lockdown rules. Hence, public can no longer depend upon governments for their safety. Public has to help themselves as per Covid19 rules laid down by their governments, failing which we would surely witness more fatalities taking place in near future. This behavioral shift is very critical, till the public adopted independent safety culture, Covid19 fatalities would most likely continue. Public cooperation needs to be strengthened through NGOs, religious/community groups, corporate social responsibility.CSR funds can be spent on activities related to addressing Covid-19 impact (Financial Express (2020). Companies integrate social and environmental concerns in their business operations and interactions with their stakeholders. There are nearly 10,000 CSR projects in India. Moreover, India has more than 3.2 million registered non-government organisations (NGOs). These resource groups and expertise are capable to mobilize social policy and programs into achievable results. These initiatives would take us further from reactive and dependent safety cultures to independent and interdependent safety cultures for saving human lives.

Thus, behavioural changes in a safety culture are achievable subject to certain presuppositions and preconditions as discussed. Safe person is considered to be the one who is alert, and observes and spot-corrects unsafe behaviour of others. Further, it is high time to focus on economic activity, as the number of people who are violating lockdown rules are very small as compared to those following. The economic slap is harsher than the disease itself. Economy fall and employment fall are serious

implications to manage in the years to come for many countries. So focusing on economy with safety measures would normalize the situation with positive energies. People should not get scared if Covid19 numbers rise, rather be bold enough to be a part of the economic activity. Those who violate SOPs, get affected by Covid19 would be managed by the governments' systems. It is crucial to understand that nearly 99.9% of India population are obeying lockdown rules for hoping that if they continue safe behaviours, then only they can thrive economy forward. However, it is crucial to realize and underline that the intervention effects of behavioural safety changes (Nilsen, 2006) at the national level in India would be gradual and long-term in nature especially when the existing safety culture is poor, reactive and dependent. This would help the concerned agencies remain focused towards policies and programs requiring large financial investments.

Best medicine to defeat Covid19 is safe behaviour, everyone has to take it sooner or later for safety of his/her life. Countries expect only safe behaviour (from citizens) which is the strength of economies. Countries would have better economies that have safe behaviours from their citizens.

According to Director- EHS, "till yesterday, no case in my housing society, now with one zee employee infected, all are scared. Till yesterday, all thought we were safe. Hope our prayers work which works when everything fails". A safety veteran said, " we don't have any visible cure in hand. Only prevention using our safe behaviour is the solution". Best safety plans failed as we didn't continue them. We need to continue focusing and reinforcing on safe behaviours till we succeed. Since the population is large, it would take time, numbers of Covid19 would increase or decrease. We can't afford to dishearten, but continue to win over Covid19 and finally defeat it for humanity.

The entire world and everyone else around us is overreacting at this juncture of fear, stress, helplessness and anxiety due to Covid19. At this time, each one of us has to try consciously to calm down during the lockdown periods and be rational to self as well as others around. It is testing times for all. Covid19 has rendered everyone feel helpless but persevere.

Nevertheless, there are many positive implications/ impacts of behavioural control or otherwise during lockdowns (Springer, 2020) as gained by safety

professionals across the country as follows. "my positive of lockdown: I reduced 5kg in 2 months with warm water and one meal off. Feeling much healthier". "I have learned to run 5-7 km in my flat and maintain physically and mentally fit. Am a great cook now making many dishes for family. Lastly started singing some bhajans (religious) and filmi songs too. Connected socially with all known's whom I had not called in last 2-3 years time especially sr. Citizens. Great fun of life explored!". "As working lady, I am with my angels, twin daughters". "I am lucky one who is working in factory when millions are at home. My subordinate could not come back after leave who have already gone before lockdown". "I too reduced by 5 Kg and also developed a leaner physique with lots of exercise at home". "Yoga, full exercise and running 40 minutes kept my body fit in lockdown. No reduction in food. I increased physical activity". "I have also reduced. I walked around 15 km a day during lockdown but within premises and by maintaining social distancing". "I also reduced but will check my weight. I could work on my hobby and did lot of introspection". "I learned online training. Use of Zoom and Cisco WebEx. ONGC is trying online training". "Have reduced 8kg in last 4 months, due to nutritional diets". "I too tried and lost 2.5 kg. and will keep it forever". "Got time for my Sitar riyaz (musical instrument practice)". "being in essential service, doing 12 hours duty per day, lots of hardships, makes me feel engaged during lockdown, felt like serving nation".

Last but not least, now everyone has to take oath that he/she will keep observation and care that at least one person next to him/her is saved from Covid19. He/she will do everything possible to fulfil this promise. This way, entire nation will be saved from deadly virus. This is true vaccine and safest behaviour. In fact, behavioural as well as medical vaccines are used in combination. In overall, the Covid19 related behavioural management is all about change management (Human Capital, 2020). It is pleasant to be change-friendly, or you would be pushed into change process. Professionals and everyone else has to keep mobilizing the change management process, be the media, health, governments, corporates, the citizens, police, etc. Let the changes be topinitiated and change be absorbed by one and all as necessary. Sustaining behavioural change is a natural gradual process for large public, and change leaders and catalysts don't ever get disheartened. Covid19 related safe behaviors can be achieved by everyone whom the change matters. Every small/big change in a corporate or country would have proportionate direct/ indirect implications which complicate the change management process and one

has to deal with strategically. Behavioural safety is a buzzword in today's scenario, it is easy to understand but complicated in adopting for nations where safety culture is already in nascent stage. We have to be on it to succeed. "To me it is forced perseverance and might have transformed few. I was surprised yesterday when saw people rushing/overtaking/honking while I was on road to meet my parents after almost 3 months. Saw many flouting directions by not wearing masks and maintaining SD as they feel 'Hame kuchh nahee huanaa hoga' (nothing will happen to me)". There area mixed of both good and examples of behavioural safety application during Covid19.

A recent focused-group-discussion with safety experts brought out the following:

Consider yourself as asymptomatic carrier of Covid19 and rigorous self-discipline would help; Ten thousand observations of employees helped to sustain social distancing, facemask wearing, hand washing but also revealed that 15% deviations are there for such Covid19 related behaviors; Keep plan b ready when someone is infected with virus; BBS works best with other safety systems, but systems alone wouldn't ensure plant safety; Sanitize every material that is brought from outside, sanitize your hands if you touch it; Employees interact with their family, family interacts with society, hence virus exposure can come from anywhere; Encourage employees for voluntary declaration of their health conditions that can put others into unsafe conditions; Behavior is dynamic in nature, people are behaving safe as if new Covid19 behaviors are being imposed, as the relaxation is provided, cities open after lockdown, people would come back to old original behaviors that would increase virus exposure; A Corona positive person was found and quarantined, and further contact tracking was done by our engineers.

A case: "In my society, no case so far due to restrictions imposed on walking and movement out of society and also no outsider inside the society since 24th March. Only one positive case due to zee employee who had gone to office due to essential services. However, his entire family tested negative. Now mind set of people is that we should now be allowed to move out as their family is negative and patient is under treatment in hospital so we all are not infected. Do you think this is right?" Beware of asymptomatic situations, its tricky, caution and learn persevering in lockdown. India most likely, because of

reactive and dependent safety cultural background, would be seeing an upward trend of incidents in industry and society at large due to Covid19 scenario. This would surely, directly or indirectly, impact our national economy, until and unless, there is an all outseamless ongoing effort to build/inculcate the independent and interdependent safety culture. Personal capacities of each leader matters most in order to achieve this and mobilize further to sustain these cultures and lead respective administrations and departments as it is much needed. One s who compromise with s a fetyknowingly/unknowingly would invite incidents/Covid19.



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NEED OF SAFE BEHAVIOUR TO MAKE A SAFER INDUSTRY AND SOCIETY

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Abstract

In industries Behavior Based Safety (BBS) is very important to prevent accident and control workplace risk. Construction or Engineering industries is hazardous prone industries. Each and every day several people killed, several injured due incident. Such incident occurs in construction or Engineering industries due to unsafe behavior of employees. Behavior Based Safety (BBS) help to gain more interest across construction industry and has the great advantage of needing the involvement of the individual Employee, in addition of course, to employer commitment to prevent workplace injury & illness.

Keyword : Behaviour Based Safety (BBS), Safety Culture, Risk Control at work place, Importance of Behaviour based safety.

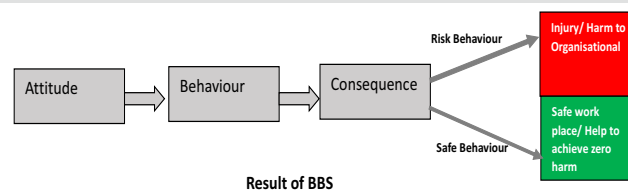
Benefits of Behaviour Based Safety (BBS)

- Increase Safety Culture at construction site
- Increase productivity
- Reduce absenteeism
- Workers feel good about their work and increase trust on employer/management
- Increase good relation with stake holders & provides a forum for recognition of positive behaviours
- Reduce workers compensation cost
- Reduce injury & illness rate
- Prevent from Prosecution by legal authority

Introduction

Behavior Based Safety (BBS) is an approach that creates a safety partnership between management and employees that continually focuses people's attentions and actions on daily Safety Behavior's that help to prevent work-related injuries and illnesses. The goal of behavior-based safety is to change the behavior of employees from "at risk" behavior's to "safe" behavior's.

Behavior based safety (BBS) addresses to company culture and values and, most importantly, when it works, it is an excellent parameter to improve safety performance at workplace. Behavior based safety help to create awareness among employees and employees understand their responsibility respect to safety and they protect self or their sub-ordinates from exposure of Potential hazard. Employees become habitual to follow safety laws and practices through self-desire and always try to adopt best safety practices to maintain high safety standard to achieve zero harm. Behavior can be defined as Negative and Positive behavior. Negative behavior always create Poor attitude among employees and which lead to cause Accident. Positive behavior create good/positive among employees and employees follow safety rules and procedures through it own desire and always involve to control work place risk.



Unsafe behaviour always hamper to work place safety culture. Poor management commitment and individual employee negative behaviour are responsible for poor workplace safety culture. Initiatives taken from employer ends in Coordination with Social partner organization as per respective state regulation and initiative such as involvement of employees in safety activity result help to achieve zero harm. In simple way we can say that Safety initiative help to create work safety culture. A safety culture is a culture in which individuals hold safety as a 'value on priority and take responsibility for the safety of their coworkers.

To reduce unsafe behaviour's from work place various approaches such as Surveillance, Effective implementation and follow up Company policy, Procedures, rules& respective state laws help to create BBS at workplace. Conducting Training & motivate to employees through reward, incentive and recognition help to increase safety culture& Control work place risk in industries. Safe behaviour always bring good safety culture in industries.

Causes of Negative Behaviour

Poor management commitment, No provision to motivate to workforce through reward, incentive and recognition, Heavy work load, Poor method of communication among management and employees, Blame culture, Ineffective implementation of Safety laws and procedure and few measure cause of Negative behaviour of employees in industries and increase unsafe behaviour and it may lead to cause of accident, Property damage or harm to industries. Employee Negative attitude parameter is main factor of negative behaviour.

Tips of BBS

Numbers of different approach and tips used in industries for BBS, in which few major are:

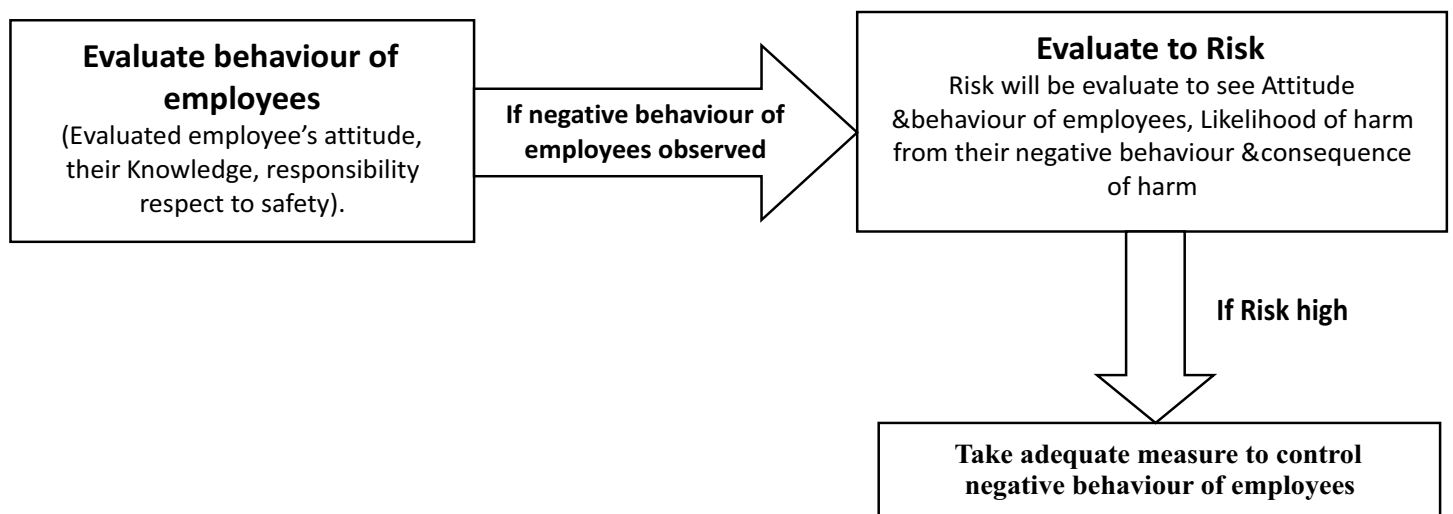
- Strong management commitment & its effective implementation
- Set clear and realistic Objective: Management should clear identify their objective related safety that want to achieve.
- Target & result evaluation: Identify Time that will required to achieve objective and identify such parameter that will help to measure company objective have achieved or not?
- Defined Clear role & responsibility section or Department wise and select easy, Positive and stable method to
- To work with associated with different similar industries and trade association to achieve Company objective
- Leadership:

- Listen to company employees and involve him to participate in safety activity and use their idea to improve system whenever applicable.
- Make communication with employees including work men in local/regional Language and avoid to develop blame culture.
- Always focus on Corrective/Preventive action to motivate work force instead of penalty or Action on Incident investigation report.
- Identify Training need and conduct time to time to improve knowledge among employees including workmen
- Motivate to workforce to create desired among them to adopting and safe practices.

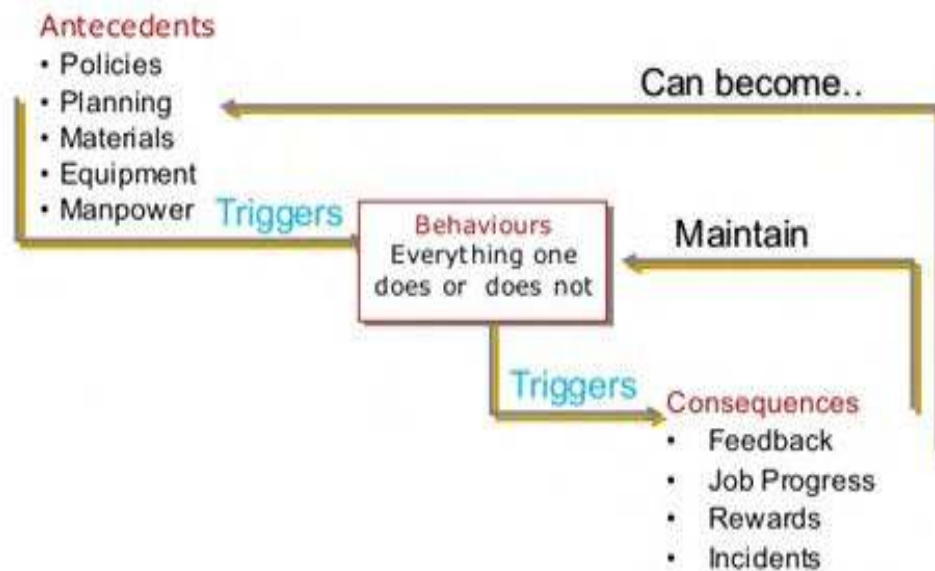
Leadership :

To evaluate risk, we identify attitude of employees then after evaluate their behaviour, after evaluating behaviour, we identify employees behaviour that is negative or positive, if employees behaviour is negative then we assess risk to see likelihood of event that may occur due to negative behaviour & their consequence. Whenever risk evaluated then, management take adequate control measure to minimise risk based behaviour as low as reasonable practicable (ALARP).

The goal of behaviour-based safety is to change the behaviour of employees from “at risk” behaviour's to “safe” behaviour's. ABC model is best tool to change human behaviour. Most of today's behavioural safety efforts are based on this theory that says all behaviours are a result of antecedents and consequences.



Behaviour Based risk evaluation



ABC Analysis

Conclusion

BBS approach always help to control work place. Behaviour based safety help to change the behaviour of employees from “at risk” behaviour's to “safe” behaviour's. Behaviour based safety create good safety culture at workplace and each individuals hold safety as a 'value on priority and take responsibility for the safety of their co-workers also. ABC model is best tool change the behaviour of employees. In BBS safety employees follow Safe Procedure and rules. In BBS Employees always eager and work to adopt safe practices and understand safety is prime responsibility of each individuals.

Strong management commitment, enforcement of rules and procedures, Reward to employees, trusting them and making communication between mgt. and employees regularly in regional language are few major parameter that help to create safety culture at workplace and develop.

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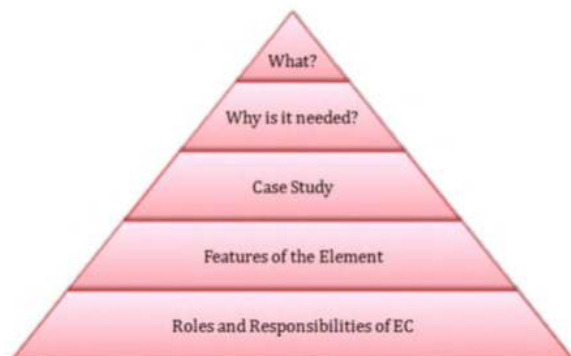
PROCESS SAFETY INFORMATION

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1. Process Safety Information (PSI)



A. Process Safety Information (PSI)

PSI can be defined as complete and accurate written information concerning process chemicals, process technology, and process equipment.

This process safety information shall include information pertaining to:

- The hazards of the chemicals used
- The technology of the process
- The equipment in the process

Hazards of Chemicals	Technology	Equipment
Toxicity	Process flow diagram	Materials of construction
Permissible exposure limits	Process chemistry	Piping and instrument diagrams (P&IDs)
Physical data	Maximum intended inventory	Relief system design and design basis
Reactivity data	Safe upper and lower operating limits	Ventilation system design
Corrosivity data	Consequences of deviations of such limits	Electrical classification
Thermal and chemical stability data		Design codes and standards employed
Hazards of inadvertent mixing of different materials		Safety systems (e.g., interlocks, detection systems)

A proper system for documenting this information is required to ensure the knowledge is maintained over time. Common platform for easy sharing/retrieval of Information.

Information collected in this element forms a basis and supports other elements which include Process Hazard Analysis, Operating Procedures, Training, Asset Integrity and Management of Change.

B. Why is it needed?

- Describes information needed for safe design, construction, operation of the process.

- Required before conducting any Process Hazard Analysis.
- Helps employer, employee, contractor identify, understand hazards posed by processes involving hazardous chemicals.
- To determine the potential causes and consequences of fires, explosions and releases of toxic chemicals.
- To identify the equipment, instrumentation, human actions and other factors which might affect the process.
- Essential for the effective implementation of process safety management system.

C. Features of PSI

D. Material Safety Data Sheets (MSDS).

The 16 sections of an MSDS that are prescribed by the ANSI standard are as follows:

Chemical Product & Company Information	Physical and Chemical Properties
Composition	Stability and Reactivity
Hazards Identification	Toxicological Information
First Aid Measures	Ecological Information
Fire Fighting Measures	Disposal Considerations
Accidental Release Measures	Transport Information
Handling and Storage	Regulatory Information
Exposure Controls/Personal	Other Information
Protection	

2. Piping And Instrumentation Drawings (P&ID)

P&ID includes graphic representation of the equipment, piping and instrumentation. An updated P&ID is a basic requirement for safe operations. The first step is to understand the legend completely used for all equipment, piping and instrumentation. Some of the information to be understood from P&ID:

- Line size
- Fluid class
- Line number
- Material of construction
- Type of Insulation

3. Process Flow Diagram

A PFD provides an overall schematic of the entire process flow system and each utility system, including material and energy balance.

- The information included in a typical PFD are,
- Process parameters
- Material and energy balances.
- Other information like:
- Phase
- Vapour mole fraction
- Normal and maximum mass and volumetric flow rates,
- Temperature
- Pressure
- Specific gravity
- Component composition of each stream.

4. Process Chemistry

Process chemistry deals with the main chemical reactions taking place inside the reactor.

It also explains the

- Side reactions that occur,
- The intermediates possible
- Runaway reactions that can occur if operating conditions change.

Case Study on BP Amoco Accident, March 13, 2001, US

Where:

- BP Amoco Polymer Plant Accident, U.S

When

- Incident occurred on March 13, 2001.

Consequences

- Three workers were killed.
- Extensive damage to property.
- Plant shut-down for 5 months

What are the causes?

- Researchers knew about the hot plastic breaking down to form gas bubbles, but the information was not shared during scale up
- The possibility of formation of pressure was not informed to the operators
- Key Findings
- Chemical Reactive Hazards Unknown.
- Personnel unfamiliar with the process description and operating principles.
- Hazard Analysis inadequate.
- Safety precautions before opening an equipment not ensured.

5. Engineering Codes and Standards:

A Standard is defined as a set of technical definitions and guidelines that should be followed by designers,

manufacturers, operators or users of equipment.

A Standard becomes code when it is adopted by one or more governmental bodies and is enforceable by law. Some of the commonly used engineering standards are

- ASME
- API
- ASTM
- BS
- DIN

6. Inventory Data

The Operating levels and maximum/minimum allowed levels for storage tanks need to be specified clearly. This information is to educate the personnel of the allowable limits beyond which risks increase exponentially.

- Hazard Analysis inadequate.
- Safety precautions before opening an equipment not ensured.

7. Design Basis of trips and Shutdowns

A trip or shutdown is set at particular value. It is required to document the design basis of these trips or shutdown set points.

The design basis will provide key information and reason to the operator on the set point value.

For each automatic trip or shut down, a cause and effect chart indicating the instrument or actuation device set point and the effect of the actuation of the trip or shut down must also be documented.

8. Quality parameters and Consequences of deviation

Documentation of the process parameters that have an impact on the product quality and their control limits is necessary. The consequences of deviation also needs to be written down and communicated to the operators concerned.

Examples of such parameters:

- Oxygen level in flue gases
- Concentration of corrosion inhibitors that are added in some process.
- Concentration of agents added
- Moisture content in instrument air.
- Oxygen levels in inert gas generators.
- Quality parameters of cooling water and boiler feed water.

9. Relief system design basis

Understanding the capacities and the set pressures of the relief systems and their design basis is a

necessity to ensure that the equipment is protected at all times.

10. Ventilation system design basis

Generally in any enclosed room involving chemicals or employees, a positive pressure is maintained by a ventilation system. This is to ensure that hazardous/flammable gases do not enter these locations in the event of a leak.

The ventilation system must be designed with

- Appropriate ventilation detection rates
- Detection system
- Alarm and trip points

The design basis for intake of fresh air for ventilation system must also be documented.

11. Equipment Data Sheets

A Datasheet will elaborate on all necessary process parameters and basic mechanical information that will enable us to understand and retrieve information whenever needed.

12. Fire and Gas Detection System

This system forms an integral part of industrial safety system that detects the break of fire/ presence of gases in an area. This type of equipment is used to detect a fire/gas leak or other emissions and can interface with a control system so a process can be automatically shut down. A detector can trigger an alarm to operators in the area where the fire/gas leak is occurring, giving them the opportunity to cope with the situation.

13. Hazardous Area Classification

Gases, vapours, mists and dusts can all form explosive atmospheres with air. Hazardous area classification is used to identify places where, because of the potential for an explosive atmosphere, special precautions over sources of ignition are needed to prevent fires and explosions.

Hazardous area classification should be carried out as an integral part of the risk assessment to identify places (or areas) where controls over ignition sources are needed (hazardous places) and also those places where they are not (non-hazardous places).

14. Material and Energy Balance

Material balances are fundamental to the control of processing, particularly in the control of yields of the products. The first material balances are determined in the exploratory stages of a new process, improved during pilot plant experiments when the process is being planned

and tested, checked out when the plant is commissioned and then refined and maintained as a control instrument as production continues. When any changes occur in the process, the material balances need to be determined again. The increasing cost of energy has caused the industries to examine means of reducing energy consumption in processing. Energy balances are used in the examination of the various stages of a process, over the whole process and even extending over the total production system from the raw material to the finished product.

15. Emergency Response Plan

The actions taken in the initial minutes of an emergency are critical. A prompt warning to employees to evacuate, shelter or lockdown can save lives. A call for help to public emergency services that provides full and accurate information will help the dispatcher send the right responders and equipment. An employee trained to administer first aid or perform CPR can be lifesaving. Action by employees with knowledge of building and process systems can help control a leak and minimize damage to the facility and the environment.

The first step when developing an emergency response plan is to conduct a risk assessment to identify potential emergency scenarios. An understanding of what can happen will enable you to determine resource requirements and to develop plans and procedures to prepare your business. The emergency plan should be consistent with your performance objectives.

16. Escape Route Plan

The escape route mapping requires:

- Zoning of the critical/hazardous areas.
- Drawing of safe assembly point outside such critical zones.
- Drawing/mapping of escape routes from those critical areas to the safe assembly point such that it does not cross other critical areas.

The escape route from each and every plant should be clearly marked. The escape route is the shortest route to reach out of the plant area to open area, which leads to assembly point. This route should be indicated on the layout plan attached to the On-site Emergency Plan.

17. Plant Layout

Plant layout is the most effective physical arrangement, either existing or in plans of industrial facilities i.e. arrangement of machines, processing equipment and service departments to achieve greatest co-ordination and efficiency of 4 M's (Men, Materials, Machines and Methods) in a plant.

The perspective of plant layout in terms of safety is to allow the Safe movement, storage of hazardous materials Placing of critical processes and equipment's at safe locations and distances. At last for planning of Emergency response plan.

18. Single Line Diagram

SLD is a simplified notation for representing a power system. Electrical elements such as circuit breakers, transformers, capacitors, bus bars, and conductors are shown by standardized schematic symbols.

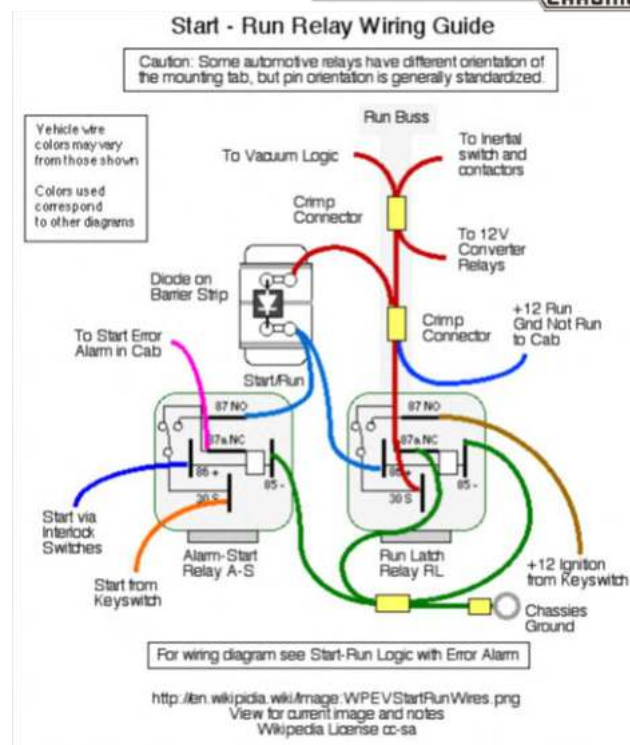
It is a form of block diagram graphically depicting the paths for power flow between entities of the system. Elements on the diagram do not represent the physical size or location of the electrical equipment, but it is a common convention to organize the diagram with the same left-to-right, top-to-bottom sequence as the switchgear or other apparatus represented. A Single Line diagram can also be used to show a high level view of conduit runs for a PLC control system.

In case of any emergency it serves the purpose of locating the connections and circuit breakers for critical equipment's, which in that case can be easily cut-off.

19. Control Wiring Diagram

A wiring diagram usually gives information about the relative position and arrangement of devices and terminals on the devices, to help in building or servicing the device. This is unlike a schematic diagram, where the arrangement of the components' interconnections on the diagram usually does not correspond to the components' physical locations in the finished device. A pictorial diagram would show more detail of the physical appearance, whereas a wiring diagram uses a more symbolic notation to emphasize interconnections over physical appearance.

A wiring diagram is often used to troubleshoot problems and to make sure that all the connections have been made and that everything is present.



Example

D. Roles & Responsibilities of EC

- Consolidation of the following:
 1. PFDs and P&IDs
 2. MSDS
 3. Design Codes for the existing processes.
 4. Material and Energy Balances for all the processes.
 5. Equipment data sheet.
 6. Inventory data.
 7. Material of construction of tanks, pipes etc.
- Should actively take part in documentation.
- Ensure specific location for the documents.
- Facilitate easy retrieval.
- Any changes relevant to PSI have to be updated in the document.
- Control or limit access to outdated documents.
- Ensure the accuracy of the information in the documents.
- Protect against physical removal or misfiling of documents.
- Support efforts to manage any changes in the documents.
- Protect knowledge from inadvertent loss.
- Should be an integral part of the PSI review



References

- OSHA PSM Standard
- ANSI for MSDS
- CSB for case study

CONDITION MONITORING & MANAGEMENT OF CHANGE IN MANUFACTURING INDUSTRIES

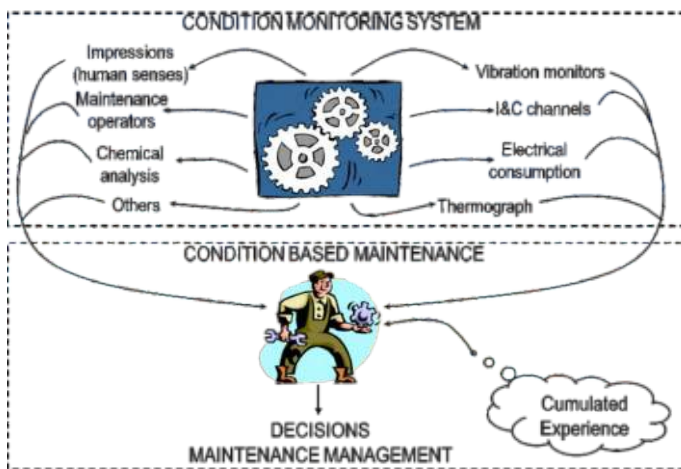
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Condition Monitoring

Condition Monitoring is the process of monitoring a parameter of condition in machinery, manufacturing, processes etc... in order to identify a significant change which is indicative of a developing fault. **Condition monitoring is a proactive equipment reliability improvement strategy.**

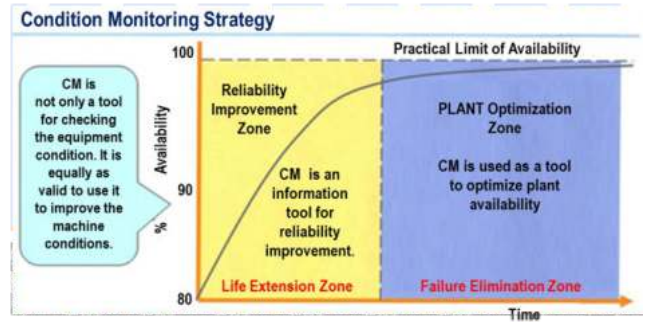


Seven Key trends for condition monitoring

- i. The development of smart sensors, and other low-cost online monitoring systems that will permit the cost-effective continuous monitoring of key equipment items.
- ii. The increasing provision of built-in vibration sensors as standard features in large motors, pumps, turbines and other large equipment items.
- iii. Increasingly sophisticated condition monitoring software, with rapidly developing "expert" diagnosis capabilities.
- iv. The acceptance of Condition Monitoring within the "mainstream" of Operations and Maintenance, with production operators increasingly utilising Condition Monitoring technologies as part of their day-to-day duties.
- v. Increasing integration, and acceptance of common standards for interfacing Condition Monitoring software with CMMS (Computerized Maintenance Management System) and Process Control software.
- vi. An increasing focus on the business implications and applications of Condition Monitoring technologies, leading to the utilisation of Condition Monitoring technologies to improve equipment reliability and performance, rather than to merely predict

component failure.

- vii. A reduction in the cost-per-point of applying Condition Monitoring technologies - possibly leading to more widespread use of these



Management of Change

WHAT IS CHANGE?

CHANGE is "The act, process or result of altering, transformation or transition from one state/ condition to another state/ condition". There are three types of changes that all managers have to be aware of: these are **Developmental** Change; **Transitional** Change and **Transformational** Change.



Why Change?

Change is all around us. As soon as a plant or processing facility is commissioned, employees, engineers and scientists begin to think of ways to make it better. Vendors develop new and improved products. Equipment needs to be bypassed or temporary repairs need to be made to reach the next turnaround.

How Does Communicate the Changes?

Is only a verbal communication sufficient for managing the changes effectively?

A robust **management of change** process can help prevent these improvements from creating problems ranging from off-spec product to catastrophic events.

What is 'Management of Change'?

Management of Change (MOC) is a structured approach to transitioning individuals, teams and organizations from a current state to a desired future state.

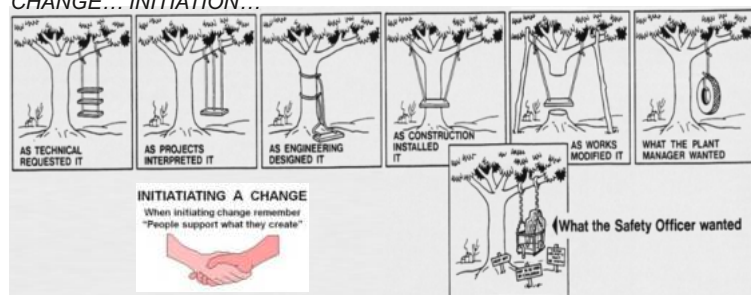
Why do we need a MOC Process?

The incidents that occurred in 1974 at the Nypro UK plant in Flix borough and in 1984 at the Union Carbide plant in Bhopal, India are examples of change gone terribly wrong.

In the Bhopal incident, a runaway reaction resulted in the release of methylisocyanate (MIC). The MIC cloud left the plant and drifted over the neighbouring town killing thousands and injuring tens of thousands. The effects of the MIC release are still felt in Bhopal today. A contributing factor in the incident was the temporary bypass of some plant safety systems. Risks associated with safety system bypass at the same time as a runaway reaction were not considered and properly managed.

At Flixborough, a 20inch pipe was installed, bypassing a damaged reactor to allow the plant to operate while the reactor was repaired. Three months later, the temporary pipe failed releasing 30 tons of flammable cyclohexane. The ensuing vapour cloud explosion killed 28 workers, injured 89 workers and members of the public and destroyed the plant. The piping design and supports had not been reviewed by an engineer or technical authority prior to making the change, and risks associated with hydraulic surge in the piping during process upsets had not been fully addressed.

CHANGE... INITIATION...



Change Models

There are several models of change management. Dr. John P. Kotter, a pioneer of change management, invented the 8-Step Process for Leading Change. Dr. John P. Kotter, the Konosuke Matsushita Professor of Leadership, Emeritus, at the Harvard Business School, invented the 8-Step Process for Leading Change. It consists of eight stages:

- Create a Sense of Urgency
- Build a Guiding Coalition
- Form a Strategic Vision and Initiatives
- Enlist a Volunteer Army

- Enable Action by Removing Barriers
- Generate Short-Term Wins
- Sustain Acceleration
- Institute Change

MOC Considerations

The procedures shall assure that the following considerations are addressed prior to any change:

- The technical basis for the proposed change;
- Impact of change on safety, health and environment;
- Modifications to operating procedures;
- Necessary time period for the change; and
- Authorization requirements for the proposed change

Management of Change is Applicable to Four "M"s:

1. Change in MACHINES eg. Facility, Equipment, Utility etc...
2. Change in MATERIAL eg. Raw Materials, Products, Packaging, Labelling etc...
3. Change in METHODS eg. Documents, Test Methods, Process, Software, Specification etc...
4. Change in MEN eg. Personnel, Vendors, Customer etc...

1) Management of Change in MACHINES

- Alterations to protective equipment systems, such as changes to critical settings for alarm, interlock, or shutdown systems; or changes involving safety relief or vent systems.
- Changes made to compensate for unavailable or out-of-service process equipment, instruments, rotating equipment, or vessels, such as using jump overs, hoses, and vacuum trucks, without established SOPs.
- Defect/ By-passing/ Modifications/ Substandard devices/ parts.
- Devices, Tools & Tackles.



2) Management of Change in Materials

- Hazard Communication i.e., MSDS & Labels etc...
- Method of Handling i.e., Manual, Automation etc...
- Quantity of material increase/ decrease in handling & storage.
- Supply of the existing Raw Materials from new vendors.
- Requirement of customer for change of product specs.



3) Management of Change in Methods

- Proposals to operate at significantly different pressures, temperatures, flow rates, acidity, etc., which are considered outside the well-understood and documented Safe Operating envelope.
- Introducing inhibitors/ catalysts etc...



4) Management of Change in MEN

- New personnel introduction.
- Involvement of other area personnel.
- Level of knowledge & understanding.
- Literacy & Ability.
- Behaviour of Personnel. Assessment of Risks involved.
- Training & Awareness of Personnel.



MOC Process

- The MOC process must address changes that range from minor changes to major capital projects as well as handling temporary and permanent changes. This can be accomplished in many ways.
- Some companies have developed “one-size-fits-all” MOC processes that are used for every change. Other companies find it easier to have multiple MOC systems.
- The multiple systems can be split based on the type of change (equipment vs. procedural), the duration (temporary vs. permanent) or the size of the change

(minor vs. major).

- The decision to use an electronic MOC process or a paper process should also be considered.
- The important thing to remember is that the MOC process or processes should be flexible, easy to use and fit your plant culture.

Basic steps of MOC process:

- Initiation; Preliminary review; Risk assessment/technical review
- Design/construct/ pre-commissioning; EHS Requirements
- PSSR; Approval to start up; Follow-up activities;
- Documentation; Legal Compliance; Approvals;
- Validation and Qualification; Vendor Qualifications
- Customer and Regulatory Notification; Drawings; Stability
- Maintenance and Calibration



MOC CHECKLIST

[illegible]

First-step Risk Analysis

1. Does the proposal introduce new chemicals in the form of new reactants, solvents, catalysts, or impurities? _____
2. If so, are the new chemicals flammable, explosive, toxic, carcinogenic, irritants, capable of decomposition, an oxidant, etc.? _____ If so, are safety data sheets available? _____
3. Does the rate of heat generation and/or reaction pressure increase as a result of this new scheme? _____
4. Is there a potential for over temperature during start-up, shutdown, normal operation or other cases as loss of agitation, loss of utilities?

5. Does the change involve revisions to critical operating procedures that could result in operating outside of the defined "safe operating envelope"? _____
6. Are the vents and pressure relief systems sufficient under the new conditions? _____
7. Is there a risk of creating a damaging vacuum condition? _____
8. Is there an increased risk of back flow or cross contamination? _____
9. Does the proposal introduce flammable liquids or gases or combustible dusts into areas that do not have the proper electrical area classifications? _____
10. Does the proposal introduce a source of ignition (including hot surfaces, flame, mechanical sparks, static electricity, electrical arcing, etc.)? _____
11. Does the proposal properly address the equipment/hardware concerns? _____
12. Does the change involve the use of one-time maintenance items such as chemical cleaning, hot tapping, jump overs, freezing lines to temporarily plug, or the temporary repair of hazardous chemical leaks? _____
13. Does the change involve the alteration of a pressure vessel? _____ and if so, is the code certification preserved? _____
14. Is there sufficient pressure different between the new operating pressure and the maximum allowable working pressure of the vessel? _____
15. Is the relief capacity adequate for process upsets, valve or tube failure, fire, loss of utilities, etc.? _____
16. Are remote-operated isolation valves now needed? _____ are "double-block-and-bleeds" required? _____
17. Have safety critical process alarms and shutdown systems been modified to include the new situation? _____
18. Will the gas detection systems, fire-water systems, diking or drainage need to be changed to accommodate the change? _____

Pre start-up Safety Review (PSSR)

Perform a pre start-up safety review for new facilities and for modified facilities when the modification is significant enough to require a change in the process safety information. The pre start-up safety review shall confirm that prior to the introduction of highly hazardous chemicals to a process:

- Construction and equipment is in accordance with design specifications.
- Safety, operating, maintenance and emergency

procedures are in place and are adequate.

- For new facilities, a process hazard analysis has been performed and recommendations have been resolved or implemented before start-up; and modified facilities meet the requirements contained in management of change.
- Training of each employee involved in operating a process has been completed.

Improving the MOC Process

The best way to ensure that the MOC process is working is to conduct periodic self-assessments or reviews. The review may be conducted by anyone with a solid understanding of the MOC process and should include a representative number of MOCs for the last 3 to 6 months. It is often better to have a person outside the department perform the review. This gives a level of independence to the review and helps find problems that someone inside the system may overlook. Many companies use a checklist or other guide to help obtain consistent results. The results can be used for individual coaching or to indicate areas of the MOC process that need to be improved.

Factors of Successful Change Management

Successful change management is more likely to occur if the following are included:

- Define measurable stakeholder aims and create a business case for their achievement (which should be continuously updated).
- Monitor assumptions, risks, dependencies, costs, return on investment, dis-benefits and cultural issues.
- Effective communication that informs various stakeholders of the reasons for the change (why?), the benefits of successful implementation (what is in it for us, and you) as well as the details of the change (when? where? who is involved? how much will it cost? etc.)
- Devise an effective education, training and/or skills upgrading scheme for the organization.
- Counter resistance from the employees of companies and align them to overall strategic direction of the organization.
- Provide personal counselling (if required) to alleviate any change-related fears.
- Monitoring implementation and fine-tuning as and when required.

Challenges

Common MOC problem areas & how to avoid them complexity

Some MOC processes attempt to be a “one-size fits-all” system. As a result, they are so complex that the users find it difficult to complete an MOC. This can lead to frustration and can also cause people to bypass the process for small changes because it is not worth the effort to run a small change through the system leading to some changes not being adequately managed. To help avoid this, consider having separate MOC processes that are specifically tailored for small changes or changes to procedures and documentation. Another method of handling this is to have a simple base MOC process that includes supplemental checklists or features that are only used when needed.

Notification & training of affected employees

This is one of the gray areas of the PMS regulation. A facility is required to train and/or notify affected employees of the change, but there are no requirements to document the training or notification associated with the MOC. To avoid problems in this area, it is best to follow the “**If you did not write it down, you did not do it**” approach. Some plants have a binder in the control room or maintenance shop with copies of the MOC and rosters so that the employees can review and sign off. Others use electronic systems or e-mail to document the communication or training. Either method is fine as long as the facility ensures that employees returning from time off due to shift schedules, vacation, etc., review the MOC information on their first shift back to work.

Start-up before approval is granted

Occasionally, changes are made active prior to receiving start-up approval. Reasons for this include emergency changes that need to be made during weekend or night shifts, superintendent or manager vacation or misunderstanding that another approval is needed before start-up can occur. To handle changes when the approvers are not available, some facilities delegate approval authorization to facility operations leaders and shift leaders. Others have a rotating on-call process where other superintendents and managers approve another department's MOCs. In the case of misunderstanding regarding the second approval for start-up, well-written MOC procedures with clear expectations for each step are critical. Flowcharts and process maps can also be helpful.

Temporary changes that last forever

Pipe leak-repair clamps and bypass lines that have been

around a long time are both examples of temporary changes that evolve into semi-permanent and permanent changes. Some companies attempt to avoid this situation by setting limits for how long temporary changes can be in effect. Other facilities conduct technical reviews and reauthorize temporary MOCs on a periodical basis. Like follow-up activities, diligence and periodic reviews are the best ways to prevent temporary changes from evolving into permanent changes.

Not completing follow-up activities

No magic bullet will ensure that follow-up activities are completed. Some companies use electronic systems that automatically send notices and generate tracking reports. Even these systems can fall short if the facility is not diligent in closing the loop and holding the assigned people accountable to complete the tasks. Periodic reviews, as described here, can also help identify when follow-up activities are not completed.

Conclusion

The Condition Monitoring and Management of Change process will help a facility meet the EHS regulations, but the benefits can reach beyond compliance. A simple, yet robust, MOC process can help ensure that risks associated with changes are understood and properly managed, employees are trained on how the change affects them, accurate procedures are in place for maintenance and operations, equipment files are up to date and spare parts are available when they are needed. When these elements are in place, a facility can meet their goal of safe, reliable operations.



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2. John Kotter's 8-Step Process for Leading Change
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HOLISTIC APPROACH IN OCCUPATIONAL SAFETY, HEALTH & HYGIENE

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Abstract

Work places and organizations are adopting a holistic approach, which, surely is advancement over the traditional management of occupational safety and hygiene (OSH). It fills the gaps and connects the dots in the existing methodologies and provides comprehensive solutions to complex management and common issues in the realm of occupational safety, health and hygiene. Existing and evolving OSH tools find a more effective use in this approach that merges them with modern management techniques. By linking and applying a holistic OSH approach between different layers of management – top management, middle level management, safety managers- supervisors and work force, the principle objectives of safety, health and hygiene for occupational workers and their environs can be realized in a more tangible manner.

Key words : Holistic approach, OSH, occupational safety, health and hygiene, BBS, total health.

1. Introduction

Millions of people across the world fall victim to occupational injuries, many of those fatal, every year across the world translating into enormous socio-economic cost to the workplace and the individuals. However, experience shows that occupational injuries and accidents are almost invariably preventable and can be avoided if existing measures and methods are effectively implemented. The formulation and implementation of a comprehensive Occupational Safety and Hygiene (OSH) program is a complex activity for which there cannot be any specific sets of guidelines. Nevertheless, there are various approaches, through which the organizations seek to attain the ultimate aim of an OSH program, which essentially is the well being of workers coupled with safe operations and workplace. These approaches differ in their treatment, depending on various factors such as type and size of organization, management attitude, organization culture, national and regional mandates, etc. Lately, safety management of many organizations has evolved from being just a sum total of conventional safety audits and passive regulatory compliance to a proactive and holistic approach. This obviously creates a consistent need to supplement traditional approaches to occupational health with new conceptual and methodological perspectives offering better handling of overall occupational health and well-being. The holistic OSH management is an offshoot of this evolutionary process at play.

2. The Traditional OSH Management and its Limitations

The conventional OSH management programs do not always improve overall safety and, more often than not, are

are merely focused on statutory technical requirements for the immediate and visible outcomes (Herrero 2002). So while these objectives may yield short term results; in the absence of a holistic approach incorporating and linking key elements of OSH philosophy, such programs render the organization's OSH vulnerable and weak for the most part. In other words, traditional strategies and methods for prevention and control require thorough updating in order to respond effectively to the fast and incessant changes in the workplace. The traditional approach has helped produce a consistent trend in the reduction of workplace injuries and illnesses. However, the approach may be limited in its ability to continue producing reductions, and the narrow focus addressing risk factors one at a time may limit the ability to improve workers' overall wellbeing. Newer and more holistic approaches, therefore, can be expected to provide a more effective path forward (NIOSH 2018).

Traditional safety program often has separate plans for hazard communication, personal protective equipment, equipment lockout, fire safety, etc. Each of these programs sets out its own unique requirements. Often, these programs restate the requirements specified in applicable OSH regulations. This can result in a duplication of effort and lack of coordination with other organizational processes and may lead to creation of occupational health and safety “silo” separate from other organizational functions. Often, safety and health is

viewed as being solely the responsibility of the OSH professionals. In the holistic approach, the emphasis is on developing interrelated processes for managing occupational health and safety hazards and risks throughout all levels and functions of the organization. Everyone is held accountable for all of their individual and collective responsibilities related to OSH. The emphasis is on developing integrated processes for handling common tasks such as training, documentation, records, corrective and preventive actions (Thea 2007). A simplified block diagram depicting conventional scheme on safety management is given below:

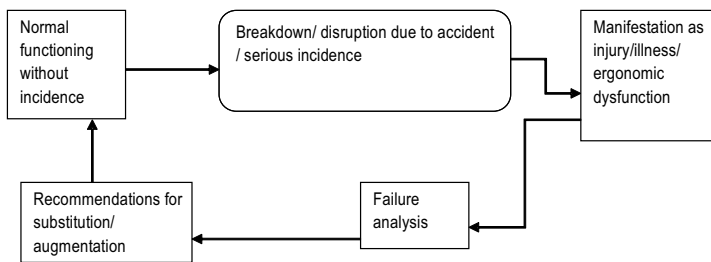


Fig. 1. Usual focus of safety management

3. The Holistic Safety and Health Management

Integration of modern tools and concepts to the OSH program of an organization is applicable at all the three levels of organization - those involved in policy-making (boards, top level management, workers' organizations), those concerned with the practical implementation of measures to promote and protect the safety and health of workers within organization (middle level management, safety managers & supervisors) and the workers. Having one system that can manage various facets of OSH holistically will improve the dialogue between operations, industrial hygienists, safety, and environmental professionals and result in reduced risks and efficiency savings (Cohen 2018).

Holistic approach amalgamates OSH policies, programs and practices to achieve protection from work-related safety and health hazards with emphasis on issues such as injury and illness prevention efforts. This involves development of clear and comprehensible documentation of OSH policies & strategies and measures to achieve them, identification and mitigation of hazards through various tools and inculcating safety and hygiene in the core attitudes of all stakeholders by way of communications, motivational techniques, involvement, and training. A mechanism is worked out at workplace to identify and track vulnerabilities and quantify acceptable risk from safety and health hazards. Therefore, building and implementing an effective health and safety program requires active participation both from employers and employees of the organization.

Occupational health has, lately, evolved into a fundamentally technical and applied field committed to identifying and eliminating the physical, chemical, and biologic hazards at the workplace (Peckham et al, 2017). Integration of social determinants of health paradigm by occupational and public health researchers and institutions is leading to a recognition of the need for a more holistic and nuanced perspective on work and its impact on workers health (Ahonen et al 2018).

A block diagram depicting key components of holistic occupational safety and hygiene, their functions and interactions within the system is represented in Figure 2.

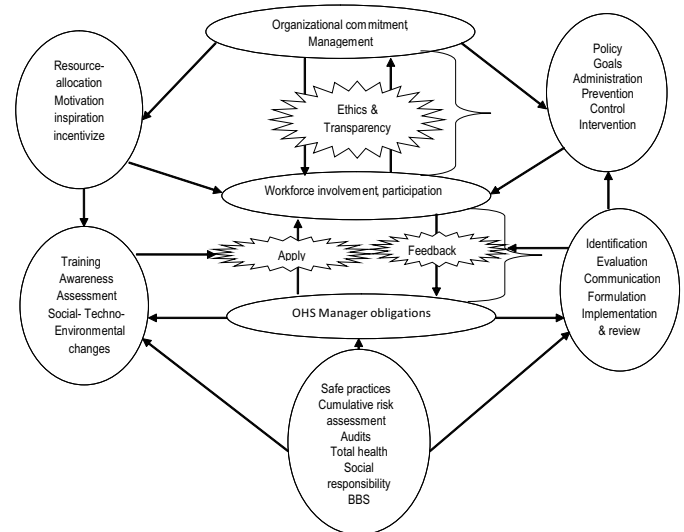


Fig2. Key components of holistic OSH, their functions and interactions within the system

A sound OSH policy is required for hazard identification, analysis and fixing of stressors in working environment, effective safety /incidence related communication and two way feedback aimed at continuous improvement. Some of the essential tools required to achieve these objectives include comprehensive ergonomic management, effective Interventions, control and prevention, training, compliance, regulations etc. Additionally, holistic OSH is supported through hazard audits, safe operating procedures, and periodic safety assessments. More recently concepts of workplace security, indoctrination of behavior based safety (BBS), workplace environmental issues, social factors etc have emerged as significant ingredients of OSH. A sound budgeting for OSH remains central to achieve all these obligations.

The core elements essentially implied in holistic approach are justification for practice consistent with the health and safety philosophy, organizational

reporting relationships, inter-functional and inter-managerial communication in an atmosphere of sincerity, honesty and openness; strict adherence to ethics in the matters of safety and hygiene, fair evaluation of technical and personnel requirements and identification and appraisal of program performance indicators. Some vital components of OSH in context of holistic mechanism are discussed below.

3.1 Communication

OSH is a cross-disciplinary area concerned with protecting the safety, health and welfare of people engaged in work environment. Effective and sincere communication at every level plays a crucial role to help organization build and maintain a culture of health and safety as their prime responsibility. This includes not only a very cogent communication about the policies, rules and regulations to motivate but also a two way communication between a worker and the safety supervisor and between workers and the management. It helps building employee engagement in the formulation, implementation and review of OSH policies and programs. There could be instances of deliberate suppression of facts such as no or distorted communication so as to reduce the index of frequency and gain safety incentives by those who are responsible for the safety. Even the workers or their respective units within the organization may tend to conceal or under-report the accident/ incidence, though they are supposed to notify the hierarchy when accidents and injuries occur (Promfret 1994, Geller, 1999). The fact that workers experience negative consequences after accident and they try to conceal them during injury investigations (Krause 1994). Conversely, in organizations with an aggressive workers association, the accident or hygiene issue becomes a bargaining chip for extracting more from the management and leads to exaggerated communication. Interviews and reporting are important communication tools in accident investigations determining the future corrective course.

3.2. Implementation

Commitment of management, safety and health professionals, first line supervisors and workers integrated together alone can bring about a successful and result oriented implementation of OSH policies. Many new concepts, including capacity building ideas and methods involving training and mutual support in the workplace, mechanisms towards dealing with discrimination and maintaining confidentiality, gender equality, voluntary counseling

and testing of employees, and worker assistance programs form part of integrated implementation program. Identifying opportunities within the organization to integrate health and well being into existing systems is very important. A lack of will and slack implementation are major hurdles to enhancing workplace safety. Impediments arising from bureaucratic excesses, impact of government restructuring, continuing confusions and contradictions in government responsibility for OSH, and lack of clarity about the responsibilities of employing units, workers, and the trade union.

3.3. Preventive Measures

Identification and prevention of any potential mishap at workplace is central to occupational safety. Amid growing consciousness for human and environmental health, the prevention of exposure to hazardous substances in the workplace is a major focus of occupational safety and health. Extensive utilization of occupational hygiene prevention and control strategies at actual workplaces again incorporates involvement of all three levels- top management, safety and health professional, and the worker - at the time of planning, or modification of a project, execution and operation and so on. The strategies involve engineering controls, administrative strategies, personal hygiene and medical surveillance, personal protective equipment, and primary prevention strategies, such as material substitution. The effectiveness of Intervention through preventive measures should be consistently evaluated and based on these findings, recommendations be made to further improve effective prevention and control strategies.

3.4. Evaluation and Audits

Today growing emphasis on implementation of occupational hygiene programs in organizations, and consequent increase in funds allocation has brought on fore the concept of evaluative measures for program performance. While the evaluation implies relating program activities to articulated measures of effectiveness, the audit, in contrast, utilizes widely accepted occupational hygiene program structural elements. Evaluation includes baseline evaluations, auditing, self-inspection and self-correction, incident investigation, medical surveillance and management review activities. In Audit a qualitative or numerical rating scale is assigned to each audit program element to indicate the extent of compliance. The audit is a frequently used valuable tool in industrial

safety, but a rather underutilized tool as far as occupational hygiene is concerned. Audits cannot substitute for evaluation, as evaluation may have high degree of uncertainties due to possible lack of measures of progress in terms of indicators such as accident frequencies and severities. However, both must complement each other and must effectively use OSH program elements and qualitative and quantitative rating scales in preparation, conduct and reporting of the audit. Periodical bench marking of reporting of the audit. Periodical bench marking of the evaluation and audit methodology in consonance with goals, mission and policies of the organization should be managed through internationally recognized management systems such as Quality Management System ISO9000 ; Environment Management system ISO14001:2004; Occupational Health and Safety Management System OHSAS 18001:1999; Behavioral Based Safety (BBS) and Information Security Management System ISO 27001:2005 and International Chemical Safety Cards (ICSCs) etc.

Holistic approach in OSH preferentially relies on integrated audit and evaluation system in conjunction with relevant management systems. Apart from reducing duplication of efforts in the implementation of overlapping requirements of the standards, a common, holistic approach allows use of a single external assessor capable of auditing all three systems at the same time. This not only reduces the number of audits undertaken in each area of the OSH ambit, but also reduces the cost of such audits.

3.5. Cumulative Risk Assessment and Total Worker Health

Both these concepts contribute in complementary ways towards improvement of worker health and well being. Worker safety and health has traditionally been dealt with identification of risk factors for injury and illness at the workplace for the most part. Although this approach, by and large, helps in reducing workplace injuries and illnesses, but may be limited in its ability to continue producing reductions. Narrow focus on addressing risk factors one at a time may limit the ability to consistently improve workers' overall wellbeing. Therefore holistic approaches to improve workers' health, safety and hygiene like cumulative risk assessment and total worker health must be integrated in the overall OSH program as a more effective path forward. It is equally important to understand that taking a holistic approach to employees' health and wellbeing may appear easier said than done, but it can only be achieved with the right team structure. Whatever work culture or structure an organization has, strong communication between all relevant

stakeholders tasked with delivering its healthcare strategy, and a strong governance plan for them to follow is the key to create an effective, holistic healthcare strategy (Barton 2014).

3.6. Sociological Aspects and the Dynamics of Changing Environment

The ethnographic approach should be used to integrate social aspects of safety to help bridge the gap between occupational and community health and structural vulnerabilities in workers' lives (Levenstein et al 2017, Flynn 2018). Liberalization of world trade, rapid technological progress, prompt modes of transport and communication has resulted in shifting patterns of employment and changes in organization work practices. Fast emerging changes in life cycles of projects and technologies can all generate new types and patterns of hazards, exposures and risks. Demographic changes, population movements and the consequent pressure on the local environment can also affect safety and health at work and can cause constant shifts in the nature of hazards. Holistic OSH policy frame works must keep up with the shifting demands of the world of work. The relationship between migration, work, and health is a rich but under explored area in OSH research.

One more area that needs to be integrated to OSH curriculum is the social responsibility of the organization towards not only to their workers but also to the society, in general, and communities in the neighborhood, in particular. The organizations and industries must prove and recognize that the success of industrial enterprises is not only measured in profitability but by the extent of their compliance with the health, safety and environmental systems and quality standards and the contribution to the community as a whole is the holistic way forward (GPIC 2017).

3.7. Behaviour Based Safety

Behaviors are the markers of attitudes/beliefs and are amenable to change through observation and feedback. Sustainable behavior change, and subsequent culture change, hinges on change in employee's behavior at all levels. Identification of critical behavior, two way feedback, employee participation and ownership of this process is essential to successful integration of BBS in overall OSH program of a workplace. Providing motivation through training and support, and an 'open door'

management policy for questions or concerns the employees have, can undoubtedly help reduce stress and encourage employees to go that extra mile – but the physical environment also plays a crucial role (Reynolds 2013).

4. Conclusion

The issue of Worker safety, hygiene and health has been addressed traditionally by identifying risk factors for injury and illness one at a time in the workplace. Holistic approach in OSH has been put forward to address the shortcomings of traditional management of OSH. It seeks to combine traditional concepts of OSH management with modern ones with a synergistic participation from top level management to the shop floor level. An increasing proportion of forward-looking organizations thus opt for holistic and comprehensive systems of OSH management programs to effectively achieve purported objectives of occupational safety, hygiene and health.

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ISSUES AND CHALLENGES OF SAFETY ENGAGEMENT OF CONTRACTUAL WORKERS IN INDIAN INDUSTRIES

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Background

In India we always deliberate in almost every forum, on occupational safety and health management, about inadequate safety commitment and at-risk behaviours of contractual workers. Since around end 70s implementation had started deploying contractors in place of own employees, in a large scale to carry out day to day operations, maintenance and repair jobs. By this process, implementations were hugely benefited by reducing cost of business operations. Large and small contractors also made money. But in the bargain, contractors' employees (workers) remained losers even after about 50 years –looking at their working conditions or holistic safety and well-being. Being in fore-front, these workers always suffer injuries even fatalities being exposed to hazards and dangerous situations, compared to company employees. Government of India is bringing up a new legislation with a view to achieve a win-win situation for both employers and workers, focusing on improvement in working conditions, environment and comprehensive safety & health through self-regulation by the employers and employees. But even after having the proposed legislation in place, achieving selfregulation or safety engagement by contractual workers would require the employers resolve first long standing issues and challenges.

Issues and Challenges

Organisations, over the years have improved their safety performance indicators without actually developing visible and describable workplace safety culture. Reason is poor safety engagement of workers. This has been my observation during my visits to both public and private sector industries since last about 20 years till date. As I see, most of the workers lack clear understanding of work safety and risks which are beyond common sense safety. Hence, commitment to safety compliance remains poor. Being the majority in numbers, these workers hold the key for building work safety culture in whatever form organization desires.

Issues related to workforce

We should dispense the thought that contractual workers in Indian industries, would not be happy to work safely to save themselves and the business. Organizations need safety leaders alongside business leaders to transform the

workers into safety followers. In my opinion the diverse demographical and socio-economic conditions involving the workforce, make the task challenging. There exist numbers of important issues that relate to the workforce. A few studies on Indian contract workers working in manufacturing sectors (private & public) reveal the following:

1. Workforce is scattered and fragmented.
2. Largely poor in social standard and rural based.
3. Working conditions poor compared to that of company employees.
4. Large scale illiteracy, low in occupational skill education and lack safety training.
5. Exploitation by employers. Workers are treated as servants or machines.
6. Do all sorts of hazardous works without adequate safety awareness and protections.
7. Almost no say in the matters of working conditions and work safety.
8. No informal relationship, even formal relationship with company managers/supervisor not very cordial, resulting mistrust and ill feelings.
9. Communication is not easy hence safety training/coaching ineffective.
10. Absenteeism is high due to work environment problems.
11. Workers attitude towards organization is largely based on wages earned and management behaviours.
12. Highly skilled workers are generally in permanent roll of contractors and the rest are temporary or casual.

These issues related to workers, are quite complex socioeconomic as well as socio-psychological in nature. Most of them feel deprived, uncared and disrespected hence feel social separation from mainstream employees. As a result, they go job hopping in search of better job conditions and better wages. Dissatisfied workers can't apply their mind and heart to work and much less on safety at work. Unless these issues are properly addressed jointly by the companies and contractors, workers engagement to safety would be a wishful thinking. However, I would draw attention of implementation to a few important related factors.

Safety Enforcement vs. Culture:

Safety compliance at work is largely by enforcement from top, not by culture. Best of systems, regulations do not inspire the workforce, as they are not correctly tutored to understand the intents behind and find implementation mechanical and uninteresting. Safety committees and frontline managers/ supervisors have not used these for the purpose of worker participation in safety management. In my view, implementation is more focused on work engagement rather than safety engagement of workers. Poor safety awareness and perceptions affect participation and commitment of workers. Effective safety communication and education backed by management commitment to safety compliance would increase understanding, awareness and perceptions. An atmosphere of good social relations and trust between executives and workers, would help build strong attitude of participation and involvement, promoting safety compliance by culture.

Socio-psychological

That brings more important issue of safety beliefs and values of executives, particularly the front line managers and supervisors who have great role driving safety participation and commitment of their reports. In an organization works are always group activities, as many people are involved directly or indirectly. Thus individual psychological and social (group) psychological factors, like – values, perceptions, and attitudes influence management of safety and risks at workplaces. Workers learn safety awareness, values and attitudes, including work procedures from their superiors having close contact. Safety audits have revealed shortcomings in this respect across the implementation. Safety awareness implies existence of hazards but no other facts and knowledge. Workers many a times use their Instinctive knowledge or Intuition which lead to short-cuts in judging or deciding actions. Safety learning based on work experience shall be given priority and attention. Workplaces. Workers learn safety awareness, values and attitudes, including work procedures from their superiors having close contact. Safety audits have revealed shortcomings in this respect across the implementation. Safety awareness implies existence of hazards but no other facts and knowledge. Workers many a times use their Instinctive knowledge or Intuition which lead to short-cuts in judging or deciding actions. Safety learning based on work experience shall be given priority and attention.

Work culture:

Work culture variations in Indian implementation are mind blowing. Every manager has his own work philosophy and practices including safety procedures

guide his team. So, workers remain largely unaware of laid down safety practices and procedures by the organisations. Thus, implementations have no common and unified work place culture. This can be observed looking to differences in work attitudes and behaviours among the groups of workers. Thus deviations in safe work practices are obvious. Unfortunately, these things are never in the knowledge of top management till an incident occurs. Then suddenly, management becomes very strict and safety compliance in all fronts, acquires top priority. This euphoria subsides with time and everything returns to business as usual.

Fear Culture

Top managements are often unaware of underlying causes of poor safety compliance by workers. Managers and supervisors do not always bring these matters to their superiors just to maintain peace at workplaces, while meeting the business targets. The managers/ supervisors, at times, deviate from set safety practices and procedures, exposing the workers to risks and workers also without questioning carryout the instructions. It is the “FEAR OF HARM” in the minds of both frontline managers / supervisors and workers, leads to FEAR PSYCHOSIS OR COMPLEX, responsible for such behaviours. Because of fear, true feeling of safety beliefs, values and attitudes remain hidden. Then we can say the SAFETY CULTURE is shadowed by FEAR CULTURE. People with this kind of mental condition would gradually lose self-respect, self-efficacy and become self-effacing. As a result they commit all kinds of errors which cause incidents. So triggers of fear complex are demotivators of safety commitment. Fear culture, though not easily perceptible, is found to exist in some degree and levels in all the implementation. Certain trigger attitudes and behaviours of superiors are:

- Safety questioning and challenging are not encouraged.
- Find faults with workforce.
- Play blame game.
- Minimal safety communication and information sharing with workforce
- Mistrust and inconsistency in dealings
- Never encourage people for their good works and suggestions.
- Do not believe in having cordial relationship with the workforce.
- Like bossing and ordering
- Procrastinates resolving safety issues.

Fear complex manifests in the typical behaviours:

- Workers take risks to save their job.
- Work target is priority for managers.
- Managers hid the safety problems from the higher-ups for fear of losing credibility, position and earning displeasure.
- Top management show interest in safety performance indices.

Safety Leadership

Workforce related issues mentioned here, are the real barriers to safety engagement of workers. Managers and supervisors have the responsibility to coach and guide them. Interaction and conversation between them, related to work safety, seem to be bare minimum or non-existent. Safety awareness monitoring and improvement should be key role of supervisors. If implementation aim for safety engagement of the contractual workers, then they must ensure their managers and supervisors possess safety leadership skills. Out of many skills, safety communication and trusted social relationship building are critical. For that matter, they should be role models to create interest, self-motivation and consciousness for safety at work. Safety leaders shall work as a catalyst to transform their workers into self-conscious spirited followers. Leader and follower relation should be like between traditional spiritual guru and disciple.

Safety Communication and Education

Learning work trade skills by the workers does not pose much of a problem, as they can pick-up these on the job from their supervisors and experienced co-workers. But safety requirements for works are determined by work hazards which vary from work to work, site to site. They have no access to the safety regulations and procedures prescribed by the organization. Having no formal technical educations make safety and risk learning difficult for the workers, due to language and required learning intelligences. Here comes the role of the contractors and implementation to help them. Most workers would learn by doing rather than theorizing. Effective experiential safety and risk coaching and demonstration on the job, would contribute to develop learning intelligences. So, safety communication for workers is a big challenge and is also a major factor of safety motivation. Though safety displays and instructions at certain high hazard workplaces are available, but these are insufficient for work hazard and risk education unless the instructions contained are explained at work sites by hand holding till the workers understand. Managers and supervisors have to be good communicators. Workers violating safety norms at work, is indicator of ineffective safety and risk communication.

Work Environment

It is unfair to expect that workers should have capability to perform safely in an unsafe work environment. A few aspects that make work environment unsafe are put forward. Work hazards of typical works at different workplaces are not always similar. So, practice of a single hazard and risk assessment with control measures of a few particular works cannot ensure safety at every work site.

Permit-to-work need to address this aspect, but found deficient in intent and implementation. Non-availability of safe and proper tools, tackles, equipment and materials used by the workers, make it worse. Inadequate supervision of works and lack of feedback from workers create perfect reward, incentive and recognition help to increase safety culture & Control work place risk in industries. Safe behaviour always bring good safety culture in industries. Ground to indulge in unsafe activities. Resultant risks are taken care of by **chance and luck**. Time and work pressure to complete jobs, are taken as excuses for deviation from safety procedures. Work assignment in general, for workers does not follow any set criteria of selection. Same worker is required to carry-out different kinds of jobs without consideration to required knowledge, skills and experience. Such workers are not happy and do not do justice to their jobs and job safety. Although safety engagement is a collective responsibility but for that matter the organization has the social and moral duty to provide right and safe work environment.

A few stories to conclude:

Of hundreds of workplace stories in my memory, I shall narrate a few here to justify the issues and challenges raised here.

- A worker was handling hazardous chemical with torn hand gloves and in another plant without any protection.
- In presence of the supervisor, workers were attending an equipment at a height climbing on running equipment below.
- A worker was doing welding work without any protections recommended.
- A pump house was waterlogged and slushy; operator working there said that this was quite normal.
- A worker without required protections, was working with an electrical grinder having broken switch and damaged chord.

I think, those from industries can visualize these stories and the pictures that emerge say volumes about the organizational deficiencies that need to be set right to promote safety engagement of workers.





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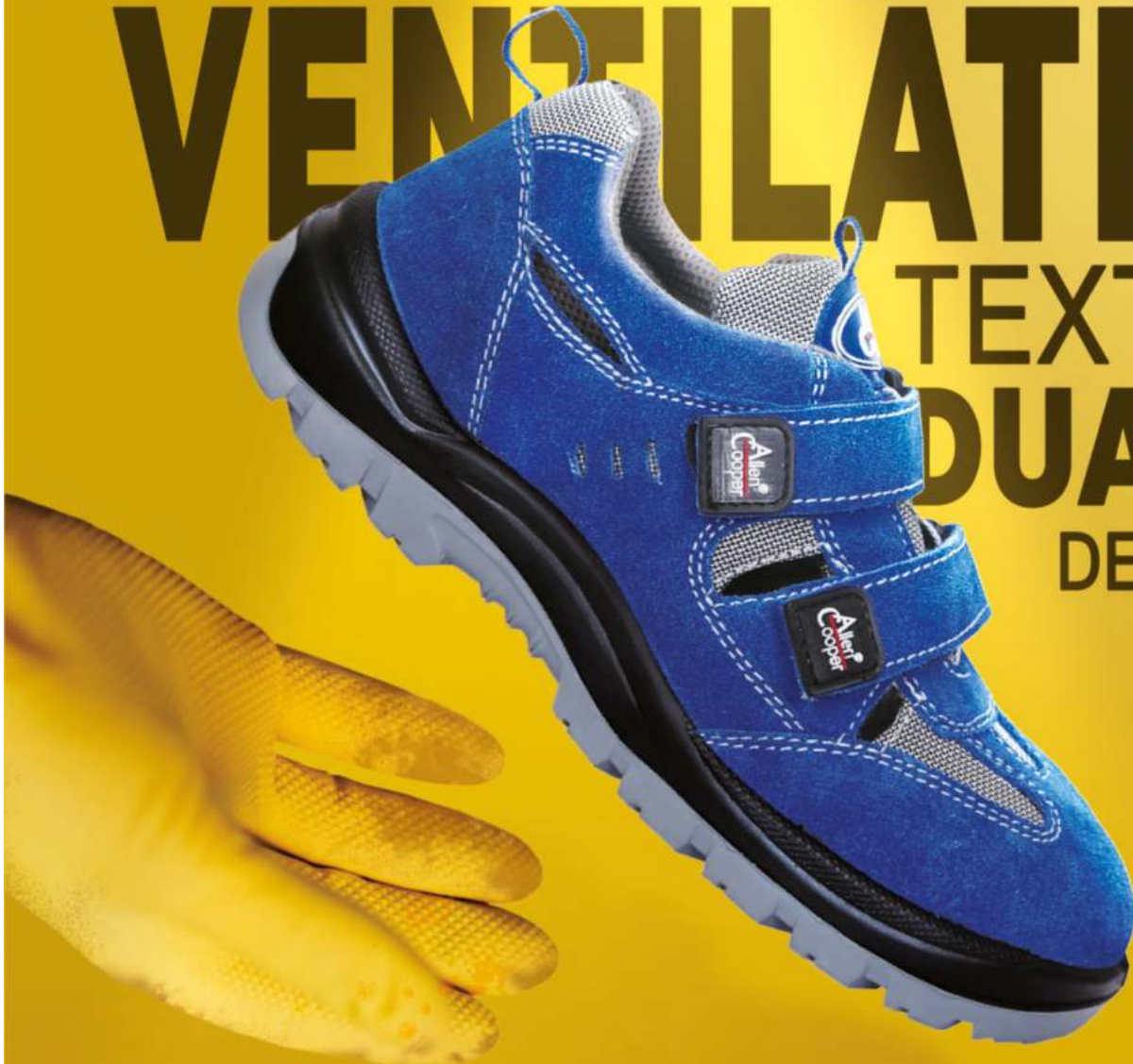


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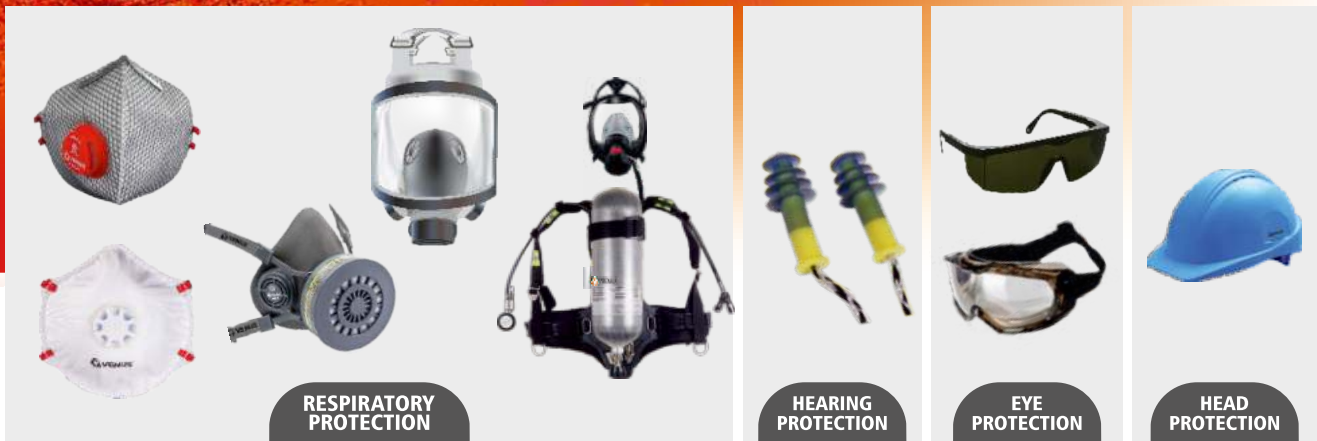
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