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SCHOOL OF BUILDING AND ENVIRONMENT
DEPARTMENT OF CIVIL ENGINEERING

UNIT – I– QUALITY MANAGEMENT AND SYSTEMS – SCI 1614

Introduction – Definitions and objectives – Factors influencing construction quality – Responsibilities and authority – Quality plan – Quality Management Guidelines – Quality circles - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.

Before reading this topic, you might read about the Relationship Between Managing Supply Chain, Operations, Quality, Customer Relationships and Customer Service.

Also consider
Customer Relationship Management
Customer Service Management
Operations Management
Supply Chain Management
Related Library Topics

QUALITY MANAGEMENT SYSTEM

INTRODUCTION

A quality management system (QMS) is a collection of business processes focused on consistently meeting customer requirements and enhancing their satisfaction. It is aligned with an organization's purpose and strategic direction (ISO9001:2015). It is expressed as the organizational goals and aspirations, policies, processes, documented information and resources needed to implement and maintain it. Early quality management systems emphasized predictable outcomes of an industrial product production line, using simple statistics and random sampling.

By the 20th century, labour inputs were the costly inputs in most industrialized societies, so focus shifted to team cooperation and dynamics, especially the early signalling of problems via a continual improvement cycle.

In the 21st century, QMS has tended to converge with sustainability and transparency initiatives, as both investor and customer satisfaction and perceived quality is increasingly tied to these factors. Of QMS regimes, the ISO 9000 family of standards is probably the most widely implemented worldwide –

the ISO 19011 audit regime applies to both, and deals with quality and sustainability and their integration.

Other QMS, e.g. Natural Step, focus on sustainability issues and assume that other quality problems will be reduced as result of the systematic thinking, transparency, documentation and diagnostic discipline. The term "Quality Management System" and the initialise "QMS" were invented in 1991 by Ken Croucher, a British management consultant working on designing and implementing a generic model of a QMS within the IT industry.

Introduction to Quality Management Systems (QMS)

A **quality management system** (QMS) can be expressed as the organizational structure, procedures, processes and resources needed to implement quality management.

Quality Management System –

- **Introduction to QMS**
- **What is QMS**
- **Why Implement QMS**
- **How to Implement QMS**
- **QMS Services**

Introduction to Quality Management System (QMS)

When you think of the word quality, what is the first thing that comes to mind?

The word quality has more than one definition. Quality could be defined as a feature or characteristic as in the following statement: They are people of integrity, which is a good quality to possess. It can also be thought as how well something is made, if it meets all required specifications or if there are any apparent defects or non-conformances in the product. Therefore, **quality is defined as a determination of how good or bad something is, or how well it meets customer expectations**. One example would be the quality of the paint on a new car. Quality systems focus on the latter definition. QMS are intended to help assure that a product or service meets or exceeds the customer's expectations each and every time.

Only by consistently meeting or exceeding the customer's perception of quality can an organization not merely survive, but grow and thrive.

What is a Quality Management System (QMS)

If we look at QMS in reverse, we can develop a better understanding of its definition.

QMS is a System for Managing the Quality of a product or process.

QMS is a system for documenting the structure, procedures, responsibilities and processes needed for effective quality management.

QMS outlines how an organization will produce, document, control and deliver a product or service possessing customer perceived value.

Why to Implement a Quality Management System (QMS)

Multiple benefits result from development and implementation of a robust Quality Management System.

Some of the benefits to implementing QMS are as follows:

- Managing product and process quality enables an organization to consistently meet the needs and wants of their customers through **Voice of the Customer (VOC)**. Increased **customer satisfaction** results in more sales, increased market share and a loyal customer base.
- Ensuring that all government regulations and **requirements are met** with every new product introduction allows marketing products worldwide.
- **Reduction of** costly **rework** and / or scrap is realized through implementation and monitoring of process controls.
- Management is able to make decisions based on data not conjecture. The data collected through the implementation of **Statistical Process Control (SPC)** and other methods allows management to make decisions based on evidence. Valuable resources are utilized where they will have the most impact on improving process efficiency and reducing quality issues.
- Engagement of the associates in the process and product improvement efforts helps to create a **continuous improvement culture** within the organization. Through the introduction of **Kaizen**, **5S** and other quality tools, the associates gradually take mental ownership of the process. Associates invested in the processes they perform are best at **identifying opportunities for improvements that will result in better quality, efficiency and safety**.

Developing and implementing a QMS enables organizations of all types be more efficient and effective. It is false impression that the quality system only involves actions performed by persons within the quality department. QMS affects multiple processes and departments within an organization from sales, design, development, production and delivery of the product or service to the customer. QMS promotes cross-functional communication and interaction throughout the organizational structure, which can result in a more unified and stronger organization.

How to Implement a QMS

Implementing a QMS into any organization, either large or small, is not a quick or simple task. It will require an investment in time and resources to successfully implement an effective QMS. Below is a list of some key areas to consider when implementing a QMS.

1. Secure Support of Top Management

Support from top management is vital to the success of any QMS implementation.

The management team of an organization must be committed to the success of the QMS. Management must be convinced of the positive impact on business efficiency and the bottom line.

Management should be directly involved in the QMS implementation process.

examples:

- **Business Analysis**: The management team should review their business structure and determine the key areas for implementation of a QMS. The key areas should be determined according to critical to customer requirements. Consider the current needs of the organization and alignment with long-term strategic goals.
- **Initial Planning**: Management should be actively involved in the planning stages by determining the resources required, assembling the teams and formulating an implementation plan. In addition, discussions should identify which existing processes will be improved first and confirm strategic or SMART goals.

2. Increase Awareness

Spread the word; schedule informational meetings across the organization to inform all associates about the pending QMS. Include information regarding how the system will benefit the customers and employees. Explain how QMS works. In addition, include the roles and responsibilities of the associates at each level and in each department.

3. Provide Expert Training

Proper training is essential for the success **of any new product** / process or management system introduction. The amount and type of QMS training is determined during the management team's initial planning phase.

The training materials should include a review of the basic concepts and tools used along with information regarding the positive impact that the QMS will provide for the associates and the organization.

4. Documents and Document Control

Proper documentation is at the heart of a well-functioning QMS.

There must be documentation developed to support the implementation, education, deployment and control functions of the system.

Documents include:

- Policies
- Procedures
- Quality Manual
- Training Materials
- Work Instructions
- Audit Forms
- Process Maps
- Control Plans

Proper documentation is vital to the success of a QMS and maintaining control of those documents is equally important. A document control system manages the creation, approval, distribution, revision, storage and disposal of all quality documentation.

The system functions to assure everyone is performing tasks in the same manner using the correct revision of the document.

5. Deployment

Deployment of the QMS should follow the implementation plan developed during the planning phase.

Document each process and define the current state. Involve the associates in the documentation of the process, utilization of various quality tools and development of metrics.

Once this is complete, the teams can focus on improvement efforts. Select an area or process with the most opportunity for improvement. Quick wins promote "buy-in" by the teams and associates by illustrating the improvements to the process and the benefit to the associates and the company as a whole.

Multiple quality and improvement tools available for use in improving a process.

They include:

- 5S +1
- Kaizen
- Process Flow Charts
- **Process Failure Mode and Effects Analysis (PFMEA)**
- **Value Stream Mapping**

The timing of the deployment is generally dependent upon the size of the organizations and the number of facilities that will be included in the implementation of the QMS.

Throughout the implementation, the company intranet is an effective tool for communicating progress towards planned objectives and sharing best practices to associates throughout the organization.

6. Measure and Control

Once deployment has occurred, the various processes within the organization must be controlled and the key process and product characteristics measured and monitored to ensure continued production of quality products.

Manufacturing processes incorporate random inspections or routine audits. The specific methods will vary depending on the organization's size, structure, the process and potential risk.

7. Audit and Maintain

Routine **Product / Process Audits** monitor adherence to policies, procedures and any certification requirements. A schedule should be developed and maintained to assure each department, area and process is audited on a regular basis. The timing of the audits will vary dependent upon the organization, process, potential risk and any regulatory or certification requirements. Audits will reveal whether or not you are actually doing what you said you were going

to do to manage quality and ensure conformance to safety / regulatory requirements.

Routine audits are effective tools for:

- Identifying inadequacies in quality management process
- Discovering problems that could result in non-compliance penalties
- Maintaining adherence to established processes and quality controls

When an **internal auditing** process is well planned, implemented and maintained, the internal audits add considerable value to the quality management process.

8. Lessons Learned and Continuous Improvement

Advantage of implementing a QMS is the ability to use lessons learned from one department or process to make improvements in similar processes across the organization. In addition, for organizations to remain competitive and thrive in today's world market, they must seek ways to continually improve their processes and product or service quality. Associates at all levels of the organization should be encouraged to look for opportunities for change and improvement every day.

Even by implementing small continuous improvements in the processes and work standards, the organization will realize sizable increases in quality, safety, efficiency and productivity. This ultimately results in a positive impact on the bottom line. Some organizations view continuous improvement as an activity, where others adopt it as a mindset.

QMS Services

Development and implementation of a QMS is not a small task. Proper implementation of the QMS will require commitment, time and resources.

If done properly, the organization can get enormous benefits. At Quality-One, our team can provide a customized approach for development and implementation of a robust QMS within the organization. We can provide QMS Consulting to assist in the development of QMS as well as QMS Training to bring the team up to speed with the new processes and related tools.

We also provide QMS Support, where one or more of our Subject Matter Experts work directly with the teams to build and implement your QMS effectively and efficiently.

QMS DEFINITIONS

A QMS is a set of policies, processes and procedures required for planning and execution (production/development/service) in the core business area of an organization (i.e., areas that can impact the organization's ability to meet customer requirements).

What are the different QMS?

List of the different types of QMS

- Document control.
- Change control.
- Enterprise & operational risk management.
- Supplier management.
- Equipment and asset management.
- CAPA management.
- Policy management.
- Internal audit.

What are the 7 quality management principles?

Seven Quality Management Principles are

- QMP 1 – Customer Focus. Meet and exceed customer expectations.
- QMP 2 – Leadership. Provide purpose, direction and engagement.
- QMP 3 – Engagement of People. ...
- QMP 4 – Process Approach. ...
- QMP 5 – Improvement. ...
- QMP 6 – Evidence-based Decision Making. ...
- QMP 7 – Relationship Management.

What is a QMS example?

A QMS is a collection of business processes focused on consistently meeting customer requirements and enhancing their satisfaction. ... It is expressed as the organizational goals and aspirations, policies, processes, documented information and resources needed to implement and maintain it.

What are the principles of quality management?

" **Quality management principles** " are a set of fundamental beliefs, norms, rules and values that are accepted as true and can be used as a basis for **quality management**. The QMPs can be used as a foundation to guide an organization's performance improvement.

What is the ISO definition of quality?

The term "**quality**" has a relative meaning. **ISO definition**:
"The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs".

What are the four main elements of quality?
Quality management ensures that an organization, product or service is consistent. It has four main components: **quality planning, quality assurance, quality control and quality improvement.**

FACTORS INFLUENCING CONSTRUCTION QUALITY

10 Factors That Affect Construction Quality Management– Creating a Strategy to Improve Construction Quality Management
Every contractor and construction firm has the intention to offer the best quality services, but many obstacles can pop up along the way to interrupt these plans. A single mistake is all it takes to trigger a series of events that can lead to expensive rework and more serious penalties if the structure's safety is compromised. Improving construction quality management starts with an understanding of the factors that can impact both safety and quality.

"**Quality in Construction**: Maintaining Quality on Construction Projects for Better Outcomes." there is relationship between quality control and safety practices.

1. **Damaged and Low-Quality Materials**
Too much water or sand in a concrete mix, lumber cut from undersized trees and improperly graded steel can all result in widespread construction quality issues. Not only do these materials fail early, they also create construction safety hazards by reacting unpredictably during the building process. Workers are often hurt when sparks are generated during cutting when they're not expected or as a structure collapses due to a lack of weight-bearing ability. Ordering only from trusted suppliers and assigning a quality control officer to check every shipment of materials is the only way to verify a project is properly supplied.

2**. Supplier and Vendor Failures**

Even when the materials themselves aren't to blame for a quality issue, problems with suppliers and vendors can raise costs and lower quality levels.
Replacing the requested building supplies with other brands and materials that don't offer the same quality can result in unhappy clients and time-consuming rework requests. Set clear expectations with all suppliers and perform random checks to verify they're still adhering to the contract. Finding new vendors may feel like a distraction in the middle of a construction project, but it can significantly improve construction quality management.

3. **Subcontractor Mishandling**

over half of construction defects can be attributed to human error. If a subcontractor hires employees without the right skills and fails to train them, workmanship errors occur that can go unnoticed for years. Screening subcontractors and other labour providers is essential to verify they're supplying skilled labourers that can catch their own mistakes. construction firms and project managers still need to follow up with independent audits of subcontractor performance to find any problems as early as possible.

4. **Failure to Document Changes and Practices**

Some quality issues aren't directly related to a mistake or design change, but rather to the lack of documentation of the change. If a material is substituted for another with a completely different maintenance and replacement cycle, failure to update the final documents can result in improper handling from the maintenance team. Use a digital file management system that simplifies the process of updating project documentation so that there's no reason to delay updates to drawings and other related files.

5. **Last-Minute Changes**

When essential features are still being engineered or discussed at late stages in the construction process, these last-minute changes often lead to serious quality issues. For example, a last-minute change in the design of the tie rod supports for a suspended walkway led to a deadly collapse at the Kansas City Hyatt Regency in July 1981. Set deadlines by which designs can't be altered anymore or make arrangements to extend the deadlines and set aside plenty of time for verifying and testing any changes to the existing designs.

6. **Scope Creep**

Construction projects often start out much simpler and smaller than the finished project. So how does a basic bridge or retail centre turn into a multi-lane highway or a three-story mall? This kind of **unplanned expansion** is often referred to as scope creep. While it's natural for all projects to change with time as new facts are discovered about costs, time constraints, and site limitations, the problem comes when the expansion in scope leads to cutting corners to stretch a limited budget and time frame. Managing the scope of a construction project ensures the contractors can maintain the same level of quality over the entirety of the work.

7. **Miscommunication Between Teams**

Project managers feel that communication issues are the number one cause of quality issues. Miscommunication leads to misapplication of new techniques, mismatched materials, and a lack of secondary and tertiary testing to discover existing problems. Tools like PlanGrid are ideal for increasing communication between all of the various teams working together on a single construction project.

8. **Complexity of Designs**

Unnecessary complexity is the enemy of high-quality work. While some level of complexity is unavoidable in cutting-edge infrastructure and commercial construction projects, designers should minimize complex techniques and unusual features whenever possible. Simplified designs are also more affordable, offering the construction firm a better profit margin even while they're producing the highest quality work.

9. **Lack of Project Management System**

A project management system determines the ideal intervals for testing the work completed so far for errors and omissions. Without a management system or plan for quality control and assurance, most construction firms wait far too long to perform essential checks on their work. Implementing a project management system based around mobile apps is a flexible and fast way to bring current projects under control.

10. **Ignored Audits and Testing**

Some construction companies stick strictly to their third-party testing and auditing plans, yet ignore the results of the tests and continue on with flawed

designs or existing quality issues. This is often due to a lack of proper designation for quality control, causing reports to bounce from project manager to lead engineer without a clear workflow for addressing the material. Determine who's responsible for reading the audit and test reports and making recommendations for rework or repairs to the contractors so that important information on quality issues isn't overlooked.
Download free ebook titled "**Quality in Construction: Maintaining Quality on Construction Projects**" for Better Outcomes for a deeper dive into the topics of quality control and workflow management.

RESPONSIBILITIES AND AUTHORITY
Defining and communicating **responsibility and authority** for everyone affecting the QMS, including a designated **management** representative who has the **authority** to ensure the system is established and maintained and is responsible to report the system's performance to top **management.**

What are the roles and responsibilities of quality management personnel?
The exact **duties** of a **quality assurance** manager vary from industry to industry. specifying **quality** requirements of raw materials with suppliers. investigating and setting standards for **quality** and health and safety. ensuring that manufacturing processes comply with standards at both national and international level.

What are the responsibilities of management in quality system management?
Establish the **quality** policy. Ensure **quality** objectives fit the strategic direction. Ensure QMS requirements are integrated into the organisation's business processes. ensure resources needed for the QMS are available.

Why should responsibilities and authorities be documented?
Organizational **Roles**, **Responsibilities and Authorities** - you should record evidence that your organization's personnel have not only been advised of their QMS **roles and authorities** but they understand their **duties** in the context of what the QMS is intending to achieve.

What is the management responsibility?
Entrusted with a leadership role, a manager is **responsible** for overseeing a department or group of employees within a specific organisation or

company. **Managers** are utilised in every sector, and the business model relies on their leadership and ability to operate the **management** structure.

What is the responsibility of quality manager?
Quality Managers are responsible for auditing internal and external processes, communications and policies on behalf of an organization.
Their goal is to ensure that every product or service a company provides meets a certain set of standards which they determine based on customer expectations.

What is the role of quality department?
The purpose of a **quality department** is to ensure profit margins by reducing inefficiencies, operations errors and product defects.
Include proactively improving capability and capacity of operations through new methods, tools or skills.

What is the role of the ISO?
ISO is the world's leading developer and publisher of standards.
In addition to quality standards, **ISO** has issued two sets of standards.
These are **ISO** 9000 to govern manufacturing process and their quality management, **ISO** 14000 to govern environmental protection.

QUALITY PLAN

What is a Construction Project Quality Plan?

A project **quality plan** is a written **plan** that details how you will manage **quality** on a specific **construction** project.

How to Write a Construction Quality Control Plan

step-by-step process that will help you write your project-specific quality plan. Let's first take a look at the overall approach you'll use for writing QC plan. The key point to keep in mind is the reason clients ask for your quality plan is that they want to know how you are going to control the quality on their projects. So, when you write QP, make it clear how you will control all areas of the project that affect quality – not just what inspections and tests you'll perform. example, controlling materials, personnel, subcontractors, and work procedures also play an important role in ensuring quality results. In the end,

your QP should give confidence to your clients that the QP control will help them to get the quality project that they expect.

Understanding what your client is looking for Quality control can mean many things to a client. Therefore, the first step is to find out what your client is looking for. Sometimes this will appear as a specification or as a mention in one of the contract documents. The baseline elements commonly found in a construction quality control plan.

As you put your quality control plan together, try to organize it so that your headings match up with your client's specifications. This will make it easier for them to verify that whether your plan meets their requirements. Essentials Elements of a Project-Specific Construction Quality Control Plan

1. Project personnel

Every project should have a designated quality manager. The one person in charge of the project quality. Your client needs to know who this person is and what his quality responsibilities are. Therefore, include this information in your quality plan along with the person's qualifications for holding this position. While the quality manager has overall responsibility for the quality of your project, your project superintendents are primarily responsible for the day-to-day field operations. Your project quality control plan should indicate what responsibilities your project superintendent(s) has and what his or her responsibilities are shown in Fig.1. Include an organization chart to show independence between the quality manager and the project superintendent.

FIG.1 QUALITY ORGANIZATION CHART

2. Quality Communications

your quality plan should include a quality communications plan that defines the touch points that you expect to have with your client.

3. Quality assurance surveillance

A big concern of many clients is what management will be doing to monitor overall project quality and how they will make sure that the project quality controls are running the way that they should. With this in mind, your client will expect some form of quality assurance surveillance. Will you be monitoring project quality on a weekly or monthly basis? What will you be reviewing? Lay it all out in your project quality plan so that your client has a good picture of how you will make sure that the project stays on track.

4. Subcontractors and suppliers.

Outside organizations play a huge role in supplying materials and carrying out work on construction projects. Tell your client what key suppliers and subcontractors you'll be using on their project. What criteria do you use to select your suppliers and subcontractors? In addition to price, most likely you checked that they were capable of performing the work or supplying quality materials.

Include the following in your quality plan:

- Procedures you followed for qualifying suppliers and subcontractors
- Listing of project suppliers and subcontractors
- Records of supplier and subcontractor qualifications

5. Project quality specifications

It goes without saying that you will comply with your customer's specifications. In many cases, the customer specifications do not tell you which building codes or industry standards apply to your scope of work. List them so there's no confusion as to which versions of what standards apply to your project.

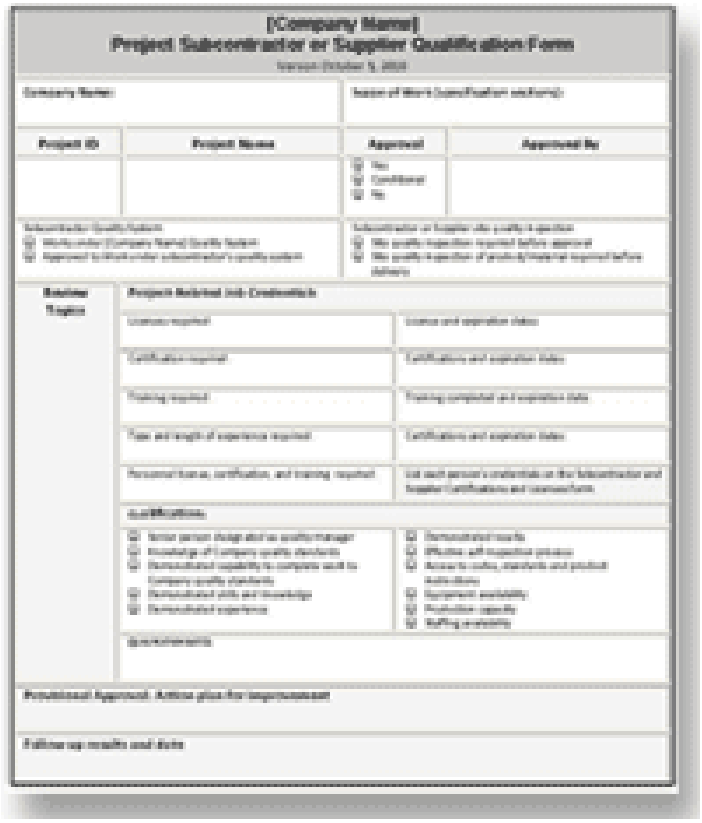
[Company Name]
Project Subcontractor or Supplier Qualification Form

FIG.2 SUB-CONTRACTOR QUALIFICATION FORM

6. Inspections and tests.

A normal part of any construction process is to inspect phases of work (steel erection) and to perform tests that verify material quality (concrete strength) or a system function (plumbing pressure test). You should list all of the inspections and tests that you expect to be performing during the course of the entire project. You should also include the inspection forms and test reports that you will use when the time comes. Most quality control plan specifications require you to submit procedures for conducting task inspections. Include these procedures even if the client doesn't specifically ask for them.

FIG.3 INSPECTION AND TEST PLAN

Your inspection procedures should include how you do the following:

- Make sure that work is ready to begin
- Handle material receiving and inspections
- Monitor work in process
- Verify that completed work meets project specifications

7. Control of non conformances

Everyone understands that from time to time things go wrong in construction. Your quality plan should discuss how you will handle these situations. Make it clear how you will control non conformances so that you protect the overall quality of the project. Be sure you define controlling non conformances in such a way that it does not include routine corrections and punch items, or you may end up creating a lot of extra paperwork for yourself.

Typical non conformance procedures include:

- Preventing cover-ups
- Corrective actions
- Records you will keep of the incident

8. Project completion inspections.

All of the things that we have discussed so far have had to do with individual tasks and phases of work. You'll also want to discuss how you will conduct

inspections and punch out near the end of the project to assure that all of the contracted work is completed to specifications.

Conclusion

Eight essential elements you should include in your project–specific construction quality control plan.

What is a quality plan in construction?

A project quality plan, referred as a quality management plan, quality assurance plan or project quality management plan, is a project- specific quality plan that describes the activities, standards, tools and processes necessary to achieve quality in the delivery of a project.

How do you write a quality plan?

1. Set up Quality Expectations. The first step for creating a project quality plan template requires you to find out what the customer of your project expects to receive at the project's end. ...
2. Plan for Quality Assurance. ...
3. Plan for Quality Control. ...
4. Organize the Process for Managing Quality.

What are the 4 types of quality control?

Identify process **control**,
acceptance sampling,
control charts and product **quality control**, and
discuss their importance

Which are the 7 QC tools?

- Stratification (Divide)
- Histogram.
- Check Sheet (Tally Sheet)
- Cause-and-effect diagram (“fishbone” diagram)
- Pareto chart (80/20 Rule)
- Scatter diagram (Shewhart Chart)
- Control chart.

Quality plan for construction projects

It is essential that services and systems in a building construction contract work are provided to conform to the requirements of the customer, and that the activities be effected as economically as practical. The achievement of these objectives is facilitated by setting up working procedures and practices, which collectively provide a **"**Work Efficient**",** yet controlled operating environment. It is the purpose of this Construction Quality Plan to give instruction to personnel, on the implementation of the company system such that the above objectives are accomplished. Documentation specific to the project will be provided to ensure full compliance with the particular requirements of the contract.

FIG.4 SYMBOL OF QUALITY CONTROL

Scope of work in construction quality plan

The project will be constructed in accordance with the specifications and contract drawings as listed in the drawing schedule. Copies of these items together with all working drawings will be held within the site offices of the contractor. distributed as follows: -

TABLE 1 DISTRIBUTION OF RESPONSE

ITEM	DISTRIBUTION
Specification	Project Manager
Contract drawings	Project Manager
Working drawings	Discipline Engineers
Drawing register	Project Manager / Discipline Engineers
Method statements	Project Manager / Discipline Engineers

Inspection & Test sheets	Project Manager
Quality Records	Project Manager

AMMENDMENTS TO THE CONSTRUCTION QUALITY PLAN

The Project Manager and appropriate members of the site team shall carry out a monthly review of the Quality plan.

General topics which will form part of the review will be as follows:

- Ensure that all management objectives are achieving the required results.
- Discuss possible improvement.
- Uncover potential danger areas and eliminate waste or loss.

WORK PROGRESS ACCORDING TO QUALITY PLAN

It will be necessary to carry out an inspection and receive approval by an authorized representative at each stage of the work. Work shall only progress beyond each stage upon receipt of this approval

Approaches to Quality Management
Some Common Approaches to Quality Management are
Balanced Scorecard
Benchmarking
Business Process Reengineering
Continuous Improvement (Process Improvement)
Failure Mode and Effects Analysis
ISO9000
Kaizen
Lean Management
Quality Circles
Six Sigma
Total Quality Management

Additional Approaches to Quality Management
Useful Tools in Quality Management

Plan Your QMS
Develop Your QMS Team
Establish Quality Management Goals
Decide What Organizational Design Changes Are Needed?
Select Your Approach to QM
Select Your Quality Management Software

Developing Your QMS

Redesign Your Organization As Needed for QMS
Begin Cultivating a Quality Management Culture
Delegate QMS Goals to Teams and Employees
Train Your Employees About Quality Management

Managing Your QMS

Manage Your QMS Teams and Employees
Manage Your QMS Software
Audit Your QMS System

ISO 10005:2018(en)
QUALITY MANAGEMENT — GUIDELINES FOR QUALITY PLANS

Foreword
ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electro technical Commission (IEC) on all matters of electro technical standardization.
The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives). Any trade

name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html. This document was prepared by Technical Committee ISO/TC 176, Quality management and quality assurance, Subcommittee SC 2, Quality systems. This third edition cancels and replaces the second edition (ISO 10005:2005), which has been technically revised.

The main changes compared with the previous edition are as follows.

a) It applies the terminology from ISO 9000:2015, which includes changes to y definitions, such as:

1) for the definition of "quality plan" (see 3.2), which has been modified to replace the phrase "procedures and associated resources to be applied when and by whom" by "actions, responsibilities and associated resources";

2) for the definition of "specific case" (see 3.3), which has been modified to make reference to "service", as ISO 9001:2015now refers to "products and services" and no longer just to "products";

3) the replacement of the terms "documentation" and "record" by the term "documented information", which is generally used in ISO management system standards to include both "procedures" and "records" which are not necessarily distinct from each other in a digital environment (documented information needed to support process operation is "maintained", which means that it is established and updated as required; documented information that provides evidence of conformity with requirements is "retained" which means that it is protected from unintended alterations).

Table 1 — changes in this document since its previous edition

ISO 10005:2005	This document
Products	Products and services
Documentation Quality manual Documented procedures Records	Documented information
Purchased product	Externally provided processes,

	products and services
Supplier	External provider
Monitoring and measuring equipment	Monitoring and measuring resources

b) It is aligned to ISO 9001:2015, leading to:

1) a significant revision in the clause/subclause sequence, titles and the addition of new material, e.g. the inclusion of "5.2Context of a quality plan", or the extension of 7.2 to also reference the monitoring of a quality plan;

2) the incorporation of "risk-based thinking".

c) A new clause (Clause 4) on using a quality plan.

Introduction

General

This document was prepared to address the need for guidance on quality plans, either in the context of an established quality management system or as an independent management activity. In either case, quality plans provide a means of relating specific requirements of the process, product, service, project or contract to work methods and practices. Quality plans are most effective when they are compatible with other associated plans. The guidance in this document can also be used where quality plans are integrated with other management plans or quality management systems.

Benefits of establishing a quality plan include increased confidence that requirements will be met, greater assurance that processes are in control and the motivation it can give to those involved. It might also give insight into opportunities for innovation and improvement.

The guidance on quality plans in this document is based on the quality management principles described in ISO 9000 and the concepts used in ISO 9001 for the establishment of quality management systems. Clause 6, which describes the typical contents of a quality plan, includes guidance to applying relevant ISO 9001 requirements. The guidance is limited to quality plans and does not replace guidance given in ISO 9000 on quality management concepts or ISO/TS 9002 on the application of ISO 9001 requirements within an organization.

This document does not replace the guidance given in industry-specific documented information. Where quality plans are required for project applications, the guidance provided in this document is intended to be complementary to the guidance provided in ISO 10006. Some terms used in this document have been changed with respect to its previous edition to improve alignment with ISO 9001:2015and other management system standards. There is no need for the terms used by an organization, whether in specifying quality plan requirements or developing a quality plan, to be replaced by the terms used in this document.

In this document, the following verbal forms are used:

"should" indicates a recommendation;

"may" indicates a permission;

"can" indicates a possibility or a capability.

Information marked as "NOTE" is for guidance in understanding or clarifying the associated text.

NOTE See https://committee.iso.org/home/tc176sc2 for guidance on the topics in this Introduction.

Using this document

This Introduction explains some underlying concepts and changes to terms used in the previous edition of this document.

Clauses 1 to 3 provide basic information (Scope, Normative references, and Terms and definitions).

Clause 4 summarizes how quality plans can be used.

Clause 5 describes the process of developing a quality plan.

Clause 6 describes the typical contents of a quality plan.

Clause 7 describes the operation and control of a quality plan.

Annex A provides examples of simple quality plans.

Annex B provides a schematic representation of a process approach applied to a quality plan

Annex C provides a correlation matrix between the clauses of this document and those of ISO 9001:2015.

Annex D provides a correlation matrix between the clauses of this document and the quality management principles from ISO 9000:2015.

The Bibliography includes a list of standards and other relevant information.

Process approach

The process approach means the systematic management of processes and their interactions to achieve intended results. Applying the process approach to quality plans assists organizations to manage the inputs, activities and outputs of each process within a coherent system of interrelated processes.

Processes referenced in a quality plan can interact with each other (interactions among quality plan processes) other processes operated within the organization's management system processes operated within other organizations (such as customers and external providers).

When considering how to manage its processes and their interactions, the organization can address these through a quality plan whether or not it has a quality management system. Annex B provides a schematic representation of a process approach applied to quality plans.

Risk-based thinking

Risk-based thinking means applying a systematic approach to considering risk (the effect of uncertainty) so that risks can be understood and managed appropriately. The application of risk-based thinking to the development and use of a quality plan enables an organization to determine the importance of particular issues and take appropriate actions to manage both risks and opportunities. A customer requesting that a provider prepares a quality plan can apply risk-based thinking to determine the minimum requirements for the type and extent of the monitoring activities. When developing a quality plan, the organization can apply risk-based thinking in deciding the processes, resources and control methods to be used. Particularly where an organization uses a standard model or template for different quality plans, risk-based thinking can assist those involved to make each quality plan fit for its intended purpose.

Scope

This document gives guidelines for establishing, reviewing, accepting, applying and revising quality plans. This document is applicable to quality plans for any intended output, whether a process, product, service, project or contract, and any type or size of organization. It is applicable whether or not the organization has a management system in conformity with ISO 9001. This document provides guidance and does not specify requirements. It is focused primarily on the provision of outputs and is not a guide to the planning of quality management system development.

NOTE To avoid undue repetition of “process, product, service, project or contract”, this document uses the term “specific case”.

Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9000:2015, Quality management systems — Fundamentals and vocabulary

Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9000:2015 and the following apply. ISO and IEC maintain terminological databases for use in standardization at the following addresses:

ISO Online browsing platform: available at https://www.iso.org/obp

IEC Electropedia: available at http://www.electropedia.org/

documented information

information required to be controlled and maintained by an organization and the medium on which it is contained

Note 1 to entry: Documented information can be in any format and media and from any source.

Note 2 to entry: Documented information can refer to:

the management system, including related **quality plans** (3.2) and processes;

— information created in order for the organization to operate (documentation);

evidence of results achieved.

[SOURCE: ISO 9000:2015, 3.8.6, modified — In Note 2 to entry, the first list item has been modified, and Note 3 to entry has been deleted.]

quality plan

specification of the actions, responsibilities and associated resources to be applied to a specific object

[SOURCE: ISO 9000:2015, 3.8.9, modified — The phrase “procedures and associated resources to be applied when and by whom” has been replaced by

“actions, responsibilities and associated resources”, and the notes to entry have been deleted.]

specific case
<quality plans> subject of a **quality plan** (3.2)
Note 1 to entry: The specific case can be a process, product, service, project, contract or other intended output for the quality plan

QUALITY MANAGEMENT GUIDELINES

These quality management guidelines are directed at Engineers and Geoscientists British Columbia professionals and provide guidance on the respective requirements under the quality management related provisions in the Act and Bylaws.

- Direct Supervision (v1.3 January 9, 2018)
- Documented Checks of Engineering and Geoscience Work (v1.3 January 9, 2018)
- Documented Independent Review of Structural Designs (v1.4 January 9, 2018)
- Documented Field Reviews During Implementation or Construction (v1.3 January 9, 2018)
- Retention of Project Documentation (v1.3. January 9, 2018)
- Use of Seal (v2.0 December 4, 2017

QUALITY CIRCLES

A **quality circle** or **quality control circle** is a group of workers who do the same or similar work, who meet regularly to identify, analyze and solve work-related problems. It consists of minimum three and maximum twelve members in number. Normally small in size, the group is usually led by a supervisor or manager and presents its solutions to management; where possible, workers implement the solutions themselves in order to improve the performance of the organization and motivate employees.

Quality circles were at their most popular during the 1980s, but continue to exist in the form of Kaizen groups and similar worker participation schemes. Typical topics for the attention of quality circles are improving occupational safety and health, improving product design, and improvement in the workplace and manufacturing processes. The term quality circles was most accessibly

defined by Professor Kaoru Ishikawa in his 1985 handbook, "What is Total Quality Control? The Japanese Way" and circulated throughout Japanese industry by the Union of Japanese Scientists and Engineers in 1960. The first company in Japan to introduce Quality Circles was the Nippon Wireless and Telegraph Company in 1962.[citation needed] By the end of that year there were 36 companies registered with JUSE by 1978 the movement had grown to an estimated 1 million Circles involving some 10 million Japanese workers. The movement built on work by Dr. W. Edwards Deming during the Allied Occupation of Japan, for which the Deming Prize was established in 1950, as well as work by Joseph M. Juran in 1954.

Quality circles are typically more formal groups. They meet regularly on company time and are trained by competent persons (usually designated as facilitators) who may be personnel and industrial relations specialists trained in human factors and the basic skills of problem identification, information gathering and analysis, basic statistics, and solution generation. Quality circles are generally free to select any topic they wish (other than those related to salary and terms and conditions of work, as there are other channels through which these issues are usually considered).

Quality circles have the advantage of continuity; the circle remains intact from project to project. (For a comparison to Quality Improvement Teams, see Juran's Quality by Design.

Contents

History[edit]

Quality circles were originally described by W. Edwards Deming in the 1950s, Deming praised Toyota as an example of the practice. The idea was later formalized across Japan in 1962 and expanded by others such as Kaoru Ishikawa. The Japanese Union of Scientists and Engineers (JUSE) coordinated the movement in Japan. The first circles started at the Nippon Wireless and Telegraph Company; the idea then spread to more than 35 other companies in the first year. By 1978 it was claimed] by JUSE in their publication Gemba to

QC Circles, that there were more than one million quality circles involving some 10 million Japanese workers.[citation needed] As of 2015 they operate in most East Asian countries; it was recently[when?] claimed[by whom?] by the President of the Chinese Quality Circles Society at the ICSQCC Conference in Beijing 30 August 1997 that there were more than 20 million quality circles in China.

Quality circles have been implemented even in educational sectors in India, and QCFI (Quality Circle Forum of India) is promoting such activities. However this was not successful in the United States, as the idea was not properly understood and implementation turned into a fault-finding exercise – although some circles do still exist. Don Dewar together with Wayne Ryker and Jeff Beardsley established quality circles in 1972 at the Lockheed Space Missile factory in California.

Empirical studies

In a structures-fabrication and assembly plant in the south-eastern US, some quality circles (QCs) were established by the management (management-initiated); whereas others were formed based on requests of employees (self-initiated). Based on 47 QCs over a three-year period, research showed that management-initiated QCs have fewer members, solve more work-related QC problems, and solve their problems much faster than self-initiated QCS. However, the effect of QC initiation (management- vs. self-initiated) on problem-solving performance disappears after controlling QC size. A high attendance of QC meetings is related to lower number of projects completed and slow speed of performance in management-initiated QCS[12] QCs with high upper-management support (high attendance of QC meetings) solve significantly more problems than those without. Active QCs had lower rate of problem-solving failure, higher attendance rate at QC meetings, and higher net savings of QC projects than inactive QCs. QC membership tends to decrease over the three-year period. Larger QCs have a better chance of survival than smaller QCs. A significant drop in QC membership is a precursor of QC failure. The sudden decline in QC membership represents the final and irreversible stage of the QC's demise. Attributions of quality circles' problem-solving failure vary across participants of QCs: Management, supporting staff, and QC members.

There are seven basic quality improvement tools that circles use:

- Cause-and-effect diagrams (sometimes called Ishikawa or "fishbone" diagrams)
- Pareto charts
- Process mapping, data gathering tools such as check sheets
- Graphical tools such as histograms, frequency diagrams, spot charts and pie charts
- Run charts and control charts
- Scatter plots and correlation analysis
- Flowcharts

Student quality circles

Student quality circles work on the original philosophy of total quality management.[18] The idea of SQCs was presented by City Montessori School (CMS) Lucknow India at a conference in Hong Kong in October 1994. It was developed and mentored by two engineers of Indian Railways PC, Bihari and Swami Das, in association with Principal Dr. Kamran of CMS Lucknow India. They were inspired and facilitated by Jagdish Gandhi, who founded CMS after his visit to Japan, where he learned about Kaizen. The world's first SQC was made in CMS Lucknow with then-13-year-old student Sucheta Bihari as its leader kshitiz Kumar deputy leader sudeep bihari, meru das namit kaura. CMS has continued to conduct international conventions on student quality circles every two years. After seeing its utility, educators from many countries started such circles. The World Council for Total Quality & Excellence in Education was established in 1999 with its Corporate Office in Lucknow and head office in Singapore. It monitors and facilitates student quality circle activities in its member countries, which number more than a dozen. SQC's are considered to be a co-curricular activity. They have been established in India, Bangladesh, Pakistan, Nepal, Sri Lanka, Turkey, Mauritius, Iran, UK (Kingston University and started in University of Leicester), and USA. In Nepal, Prof. Dinesh P. Chapagain has been promoting the approach through QUEST-Nepal since 1999. He has written a book entitled A Guide Book on Students' Quality Circle: An Approach to prepare Total Quality People, which is considered a standard guide to promote SQC's in academia for students' personality development

QUALITY CIRCLES
(Q.C): Meaning, Objectives and Benefits

After reading this article you will learn about:- 1. Meaning of Quality Circles 2. Characteristics of Effective Quality Circles 3. Objectives 4. Implementation 5. Organisation and Working 6. Rules 7. Duties of Circle Leader 8. Steps for Setting up Quality Circles 9. Benefits 10. Launching of Programme.

Meaning of Quality Circles:

Conceptually Quality Circles can be described as a small group of employees of the same work area, doing similar work that meets voluntarily and regularly to identify, analyse and resolve work related problems.

This small group with every member of the circle participating to the full carries on the activities, utilising problem solving techniques to achieve control or improvement in the work area and also help self and mutual development in the process.

The concept of the Quality Circle is based on "respect for the human individual" as against the traditional assumption based on suspicion and mistrust between management and its employees. Quality circles built mutual trust and create greater understanding between the management and the workers. Cooperation and not confrontation is the key element in its operation. Quality Circles aims at building people, developing them, arousing genuine interest and dedication to their work to improve quality, productivity, cost reduction etc.

Thus we can say that a quality circle is a group of 5 to 8 employees performing similar work, who volunteer themselves to meet regularly, to identify the cause of their on-the-job problems, employ advanced problem-solving techniques to reach solutions and implement them. The concept is based on the premise that the people who do a job everyday know more about it than anyone else and hence their voluntary involvement is the best way to solve their work related problems.

The Quality Circle concept provides an opportunity to the circle members to use their wisdom, creativity and experience in bringing about improvements in the work they are engaged in by **converting the challenging problems into opportunities** and it contributes to the development of the employees and in turn benefits the organisation as well. The concept encourages the sense of belongingness in circle members and they feel that they have an important role to play in the organisation.

Characteristics of Effective Quality Circles:

1. The atmosphere should be informal, comfortable and relaxed. The members should feel involved and interested.
2. Everyone should participate.
3. The objectives should be clear to the members.
4. The members should listen to each other.
5. The group should feel comfortable even when there are disagreements.
6. The decisions should generally be taken by a kind of consensus and voting should be minimum.
7. When an action is required to be taken, clear assignments should be made and accepted by all the members.
8. The leader should not dominate the group. The main idea should not be as to who controls but how to get the job done.
9. Until a final solution is found and results are attained feedback is necessary.

Objectives of Quality Circles:

Some of the broad objectives of the Quality Circle are:

- To improve quality, productivity, safety and cost reduction.
- To give chance to the employees to use their wisdom and creativity.
- To encourage team spirit, cohesive culture among different levels and sections of the employees.
- To promote self and mutual development including leadership quality,
- To fulfill the self-esteem and motivational needs of employees.
- To improve the quality of work-life of employees.

Implementation of Quality Circles in an Organisation:

For the success of Quality Circle programme, following actions are necessary in the Organisation:

(a) Few managers representing production, quality control, design, process planning form the Quality Circle (Q.C.) steering committee. This acts as a policy making body and will monitor the Q.C. in the Organisation.

(b) Top management must attend the orientation courses designed for them.

(c) A committed top and middle management is necessary.

(d) A facilitator must be appointed, who serves as a link between top management, Q.C., steering committee, middle management circle leaders and circle members. Facilitator will coordinate training courses; get the support from all concerned including top management Q.C., steering committee, circle

leader and circle members to help the circle leader in conducting the meetings, and to provide necessary resources.

Organisation and Working of Quality Circles:

Q.C. was conceived in Japan in 1962 as a forum for training its work force for improving the quality of products. Q.C. is a voluntary one. Employees are free to join or not to join. In it, 8 to 10 employees including the Supervisor from same workshop doing similar work join together as a group. The Supervisor can become leader of the group, if the members of Q.C. so desire. It is a part time activity; members of Q.C. are allowed to meet for an hour every week. During the various meetings, these groups progressively identify, select, analyse and solve the problems. Later they offer their proposed solutions to management for consideration, approval and implementation.

Additionally a senior officer from same workshop is nominated as facilitator who guides the activities of the group. A Management Committee at senior level is also formed, which overview the progress of Quality Circles. Training of members, leaders and facilitators is very important for the success of programme.

Rules for Quality Circles:

(a) Each member can contribute an idea on his turn in rotation.

(b) Each member offers only one idea per turn regardless of how many he or she has in mind.

(c) Not everyone has an idea during each rotation, when this occurs just say "Pass".

(d) No criticism or comments should be passed on the ideas being contributed by the member whatever old it may look to be, welcome their ideas.

(e) During brain-storming, no evaluation of suggested idea should occur. This applies equally to leader, phrases such as "We have tried it before", "Impractical", "Well" "May be it would work". "Doubtful", "Very good" etc. should not be uttered.

(f) Members can vote by raising their hands.

(g) Only supporting votes are taken. Votes against the ideas are not allowed.

(h) The time allotted for brain-storming session should be variable. The length of time that can be spent profitably will vary widely with nature of problem and the group itself. As a general practice, one hour is probably the minimum.

(i) While members give their ideas, they are recorded by the Recorder on a large sheet.

(j) It is often helpful to set a goal originally, i.e. Let us start for 30 ideas.

(k) When all members say "pass" then the first phase of brain-storming session is over. This means all ideas have been exhausted.
(l) Now all the ideas recorded on the sheet are displayed.
(m) These massive number of ideas are then narrowed down by the process of voting. The voting technique works because the members are experts in their areas. Members vote on each idea. The leader records each vote next to the idea.
(n) Members can vote for as many ideas as they feel have value. Only supporting votes are taken.
(o) Leader draws a circle around those ideas that receive the most votes. The members thus find that many of the top ideas will be so identified.
(p) Now the members can focus on a few important ideas instead of being somewhat confused by a large number of them. These few important ideas are voted on to give ranking to the circle ideas. Leader writes the ranking number beside each idea that has been circled.
(q) A member can ask for voting on any idea and argue for or against it. Others can join, if they wish. Only when the discussion has finished then the voting take place.
Idea ranked in the session can then be taken up for analysis or solution later on.

Duties of Circle Leader:

For the success of Quality Circles, circle leader must have following duties:

(i) He must assume the responsibility of guiding the members.
(ii) He must make his members sure about what is going on.
(iii) He must channelise the discussions.
(iv) Every member is allowed equal opportunity.
(v) Specific task be assigned to each member.
(vi) He must work in coordination with facilitator.

Steps for Setting up Quality Circles:

For starting Quality Circles in an organisation, following steps should be taken:

(i) First of all Managers, Supervisors and Foremen must be made to understand the concepts and activities of Q.C.
(ii) Management's total support and commitment should be made known to everyone in the organisation.
(iii) Steering committee is formed with the top management personnel to give direction to Quality Circle activities.
(iv) A facilitator (or sometimes known as promoter) is selected from the senior management level, who will serve as coordinator and advisor to the circle.

(v) Supervisor and foreman are then trained to act as Q.C. leaders.
(vi) Members of each circle must be selected from the persons who are doing similar type of work or belong to the same department or section.
(vii) Membership to the circle is voluntary.
(viii) First few meetings of the circle are held with a view to train them.
(ix) To start with, only one to two circles should be formed in an organisation, and then increase the number gradually as more and more experience is gained.
(x) Meetings must be held regularly, may be once in a week initially and once in a month on completion of basic training of members.
(xi) Everyone's suggestion or problem matching with the circle's objectives is discussed.
(xii) Total participation of team members must be encouraged.
(xiii) Recommendations of the circle must be considered and decisions should be taken without delay.

Benefits of Quality Circles (Q.C.):

1. Through the forum of Q.C. the chronic problems-of organisations which really create hurdles in work get resolved by the grass root employees of organisation, whose knowledge and experience otherwise is not fully utilized.
2. With such a capable work force, any organisation can easily undertake more difficult and challenging assignments for its growth and profit.
3. As the employees gain experience they take more challenging projects, in due course they undertake projects on cost reduction, material handling, quality improvement, preventing wastage, improving delivery schedule, improving customer service, improving inspection and test methods, preventing accidents improving design and process etc.
4. Cost reduction.
5. Increased productivity.
6. Improved quality.
7. Better communication.
8. Better house-keeping.
9. Increased team work.
10. Smooth working.
11. Better mutual trust.
12. Greater sense of belongingness.
13. Increased safety.
14. Better human relations.

Launching of Quality Circle Programme:

The typical steps for launching programme are as under:

(i) Orientation Programme for Senior Management Personnel.
(ii) Orientation Programme for Managers and Executives.
(iii) Orientation Programme for Selected Supervisors.
(iv) Orientation Programme for Workers (selected area).
(v) Formation of Circles (Minimum 2 and Maximum 4).
(vi) Training of Facilitators.
(vii) Training of Leaders.
(viii) Q.C. meetings for projects

ISO 9000 FAMILY OF STANDARDS

What are ISO 9000 quality standards?

ISO 9000 is defined as a set of international **standards** on **quality** management and **quality** assurance developed to help companies effectively document the **quality** system elements needed to maintain an efficient **quality** system. They are not specific to any one industry and can be applied to organizations of any size.

How many ISO 9000 standards are there?

ISO 9000 is often used to refer to a family of three **standards**: **ISO 9000**:2005 - Fundamentals and vocabulary. **ISO** 9001:2015 - **Requirements**. **ISO** 9004:2000 - Guidelines for performance improvement.

What are the three components of the ISO 9000 2005 standard?

Eight quality management principles have been identified that can be used by top management in order to lead the organization towards improved performance.

a) Customer focus. ...
b) Leadership. ...
c) Involvement of people. ...
d) Process approach. ...
e) System approach to management. ...
f) Continual improvement.

What are the 7 principles of quality management?

The ISO 9000:2015 and ISO 9001:2015 standard is based on the following Seven principles of Quality management.

– Customer Focus. ...
– Leadership. ...
– Engagement of People. ...
– Process Approach. ...
– Improvement. ...
– Evidence-based Decision Making. ...
– Relationship Management.

WHAT IS THE ISO 9000 STANDARDS SERIES?

Quality Glossary Definition: ISO 9000 series standards

ISO 9000 is defined as a set of international standards on quality management and quality assurance developed to help companies effectively document the quality system elements needed to maintain an efficient quality system. They are not specific to any one industry and can be applied to organizations of any size.

ISO 9000 can help a company satisfy its customers, meet regulatory requirements, and achieve continual improvement. It should be considered to be a first step or the base level of a quality system.

- ISO 9000 vs. 9001
- 30 years of ISO 9000
- ISO 9000 resources

ISO 9000 VS. 9001

ISO 9000 is a series, or family, of quality management standards, while ISO 9001 is a standard within the family. The ISO 9000 family of standards also contains an individual standard named ISO 9000. This standard lays out the fundamentals and vocabulary for quality management systems (QMS).

ISO 9000 series of Standards

The ISO 9000 family contains these standards:

- ISO 9001:2015: Quality Management Systems - Requirements
- ISO 9000:2015: Quality Management Systems - Fundamentals and Vocabulary (definitions)
- ISO 9004:2018: Quality Management - Quality of an Organization -

Guidance to Achieve Sustained Success (continuous improvement)

- ISO 19011:2018: Guidelines for Auditing Management Systems

ASQ is the only place where organizations can obtain the American National Standard Institute (ANSI) versions of these standards in the ISO 9000 family.

ISO 9000 history and revisions: ISO 9000:2000, 2008, and 2015. ISO 9000 was first published in 1987 by the International Organization for Standardization (ISO), a specialized international agency for standardization composed of the national standards bodies of more than 160 countries. The standards underwent major revisions in 2000 and 2008. The most recent versions of the standard, ISO 9000:2015 and ISO 9001:2015, were published in September 2015. ASQ administers the U.S. Technical Advisory Groups and subcommittees that are responsible for developing the ISO 9000 family of standards. In its standards development work, ASQ is accredited by ANSI.

ISO 9000:2000

ISO 9000:2000 refers to the ISO 9000 update released in the year 2000.

The ISO 9000:2000 revision had five goals:

1. Meet stakeholder needs
2. Be usable by all sizes of organizations
3. Be usable by all sectors
4. Be simple and clearly understood
5. Connect quality management system to business processes

ISO 9000:2000 was again updated in 2008 and 2015. ISO 9000:2015 is the most current version.

ISO 9000:2015 principles of Quality Management

The ISO 9000:2015 and ISO 9001:2015 standards are based on seven quality management principles that senior management can apply to promote organizational improvement.

FIG.5 ISO 9000 QUALITY MANAGEMENT PRINCIPLES

1. Customer focus

Understand the needs of existing and future customers
Align organizational objectives with customer needs and expectations
Meet customer requirements
Measure customer satisfaction
Manage customer relationships
Aim to exceed customer expectations
Learn more about the customer experience and customer satisfaction

2. Leadership

Establish a vision and direction for the organization
Set challenging goals
Model organizational values
Establish trust
Equip and empower employees
Recognize employee contributions
Learn more about leadership

3. Engagement of people

Ensure that people's abilities are used and valued
Make people accountable
Enable participation in continual improvement

Evaluate individual performance
Enable learning and knowledge sharing
Enable open discussion of problems and constraints
Learn more about employee involvement

4. Process approach

Manage activities as processes
Measure the capability of activities
Identify linkages between activities
Prioritize improvement opportunities
Deploy resources effectively
Learn more about a process view of work and see process analysis tools

5. Improvement

Improve organizational performance and capabilities
Align improvement activities
Empower people to make improvements
Measure improvement consistently
Celebrate improvements
Learn more about approaches to continual improvement

6. Evidence-based decision making

Ensure the accessibility of accurate and reliable data
Use appropriate methods to analyze data
Make decisions based on analysis
Balance data analysis with practical experience
See tools for decision making

7. Relationship management

Identify and select suppliers to manage costs, optimize resources, and create value
Establish relationships considering both the short and long term
Share expertise, resources, information, and plans with partners
Collaborate on improvement and development activities
Recognize supplier successes
Learn more about supplier quality and see resources related to managing the supply chain

Purchase ISO 9000:2015
Published hard copy
PDF e-standard

Purchase ISO 9001:2015
Published hard copy
PDF e-standard

FIG.6 ISO STANDARDS-AUDITING CATALOG

30 YEARS OF ISO 9000

The ISO 9000 series of standards celebrated its 30th anniversary in 2017

First published in March 1987, ISO 9001: Quality management systems - Requirements has become the most successful standard in the history of the International Organization for Standardization.

The popularity of the ISO 9000 series paved the way for other management system standards, including:
ISO 14000: Environmental management systems
ISO 26000: Guidance on social responsibility
ISO 31000: Risk Management Principles and Guidelines

ISO 9001 certification

ISO 9001 is the only standard within the ISO 9000 family to which organizations can certify. Learn more about ISO 9000 training and certifications with ASQ's ISO 9000 courses and learning materials.

Get started with ISO 9000

ASQ is the only place to get ANSI/ISO/ASQ Q9001-2015, the American National Standard version of ISO 9001:2015.

Available formats include:
Published hard copy
E-standard for immediate download and viewing (Please note, e-standards cannot be printed.)
Spanish edition
Site license for posting an electronic version to your Local Area Network or Intranet.

Visit Standards Central for more resources.
RESOURCES FOR ISO 9000 AND OTHER STANDARDS

You can also search articles, case studies, and publications for ISO 9000 resources. **AS9100 Keeps Bosch Communications Flying High in Aerospace Industry** (PDF) In just 11 months, Bosch Communications earned certification to both ISO 9001 and AS9100, the international quality management system standard for the aerospace industry.

Certifying the Certifier (PDF) Over a three-year period, Quality Management Company (QMC) improved itself from the inside out—and became ISO certified in the process. ISO 9001 provided QMC with a logical framework for developing a quality management system.

Prescription for Community-Based Healthcare Includes ISO 9001 (PDF) The Community Anticoagulation Therapy Clinic demonstrates how ISO 9001 principles can provide a framework for a community model of care delivery and patient safety. Customer and provider surveys demonstrate 100% satisfaction with the clinic, which uses a controlled document system based on ISO 9001, internal and external auditing, and preventive and corrective action plans.

Agricultural Firms Gain Competitive Edge With USDA's ISO 9001-Based Verification Program (PDF) The U.S. Department of Agriculture's Process Verified Program uses the ISO 9001:2000 standard to evaluate the quality management systems of agricultural businesses.

U.S. Air Force Earns High-Flying Results with Quality Management Specifications for Suppliers (PDF) Adopting ISO 9001 compliance as a sourcing criterion in its supplier selection process and requiring suppliers' quality management representatives to become ASQ Certified Quality Auditors have saved the Air Force millions of dollars and nearly eliminated critical defects in supplier products and services.

Continuous Improvement in Public Schools Through ISO 9001:2000 (PDF) Since Racine Unified School District achieved ISO 9001:2000 certification, the district has made notable progress in closing the achievement gap between demographic groups in reading and math, decreasing truancy and suspensions and increasing parent satisfaction.

ISO 9000 Series of Quality Standards

The ISO 9000 family of standards is the same across the globe even though they are called by different names. Each member country has their own entity authorized by ISO to manage the standards, but they are all the same exact ISO 9000 quality documents.

What is the ISO 9000 series of quality management system standards?

The ISO 9000 series was created by the International Organization for Standardization (ISO) as international requirements and guidelines for quality management systems. It was originally introduced in 1987 and over the years has established itself in the global economy having been adopted in over 178 countries with over one million registrations.

The phrase "ISO 9000 family" or "ISO 9000 series" refers to a group of quality management standards which are process standards (not product standards).

ISO 9000 Quality management systems – Fundamentals and Vocabulary, referenced in all ISO 9000 Standards.

ISO 9001 Quality management systems – Requirements, contains the requirements an organization must comply with to become ISO 9001 certified.

ISO 9002 – **Guidelines** for the application of ISO 9001:2015

ISO 9004 – Managing for the sustained success of an organization, provides **guidelines** for sustaining QMS success through evaluation and performance improvement.

ISO 9001:2015 is the current version of the ISO 9001 standard. ISO 9001 lists requirements, while the other standards in the 9000 family provide guidelines and information. People often say "**ISO 9000 certified**", but what they mean is they have met the requirements of the ISO 9001 standard. Read more about ISO 9001 Certification.

The ISO 9000 Series of Quality Standards is not industry specific and is applicable to any manufacturing, distribution or service organization. It is managed by Technical Committee (TC) 176, comprised of international members from many industries and backgrounds.

What are the older (obsolete) ISO 9000 quality standards?

ISO 9000 (1994) originally had three QMS models depending on the primary function:

- **ISO 9001:1994** Model for quality assurance in design, development, production, installation, and servicing was for companies and organizations whose activities included the creation of new products.
- **ISO 9002:1994** Model for quality assurance in production, installation, and servicing had basically the same material as ISO 9001 but without covering the creation of new products. Learn more about ISO 9002.
- **ISO 9003:1994** Model for quality assurance in final inspection and test covered only the final inspection of finished product, with no concern for how the product was produced. Learn more about ISO 9003.

All of these were combined into ISO 9001:2000, which was updated to ISO 9001:2008 and is now ISO 9001:2015.

What standards support the ISO 9000 Series of Quality Standards?

Other ISO quality standards were created to support the ISO 9000 family, and not all start with ISO 9001:

- ISO 10000 Series of Standards
- What is ISO 19011?
- What is ISO/IEC 17021?

Standards based upon ISO 9001

There are other ISO quality standards created based up the 9000 family which are specific to certain industries (Aerospace, Automotive Medical Devices, etc):

- Standards based upon ISO 9001

PREPARING QUALITY SYSTEM DOCUMENTS

What is quality system documentation?
The QMS **documentation** can consist of different types of **documents**. Usually, it includes **documents** such as **quality** policy, **quality** manual, procedures, work instructions, **quality** plans, and records

What are the documents required for quality control?
The standard requires that you document the following:
Quality Manual.
Quality Policy.
Quality Objectives.
Quality Records.
Six Procedures. Control of Documents (4.2.3) Control of Records (4.2.4) Internal Audit (8.2.2) Control of Nonconforming Product (8.3) Corrective Action (8.5.2) Preventive Action (8.5.3)

How do you prepare a quality manual document?
To develop a quality manual, you might consider these steps:
List policies to be written (note any ISO requirements that do not apply).
Draft policies based on applicable ISO requirements.
List operating procedures or refer to them as appropriate.
Determine format and structure of the manual and make the first draft.

What are the quality documents?
The QMS **documentation** can consist of different types of **documents**. Usually, it includes **documents** such as **quality** policy, **quality** manual, procedures, work instructions, **quality** plans, and records.

How to structure quality management system documentation

Author: Ana Meskovska

Usually, when people think of quality management system documentation, they envision loads of documents, and unnecessary and bureaucratic procedures. This is because companies often go overboard when documenting their quality management systems. However, this doesn't need to be the case. It is true that the international standard for quality management systems (ISO 9001) requires

certain documentation (see this article: List of Mandatory Documents for ISO 9001). The purpose and the benefits of the QMS documentation are manifold: it provides a clear framework of the operations in an organization, it allows consistency of processes and better understanding of the QMS, and it provides evidence for achievement of objectives and goals. When designing QMS documentation, you should focus on efficiency and create processes and documents that are applicable in your organization.

QMS documentation hierarchy

The QMS documentation can consist of different types of documents. Usually, it includes documents such as quality policy, quality manual, procedures, work instructions, quality plans, and records. The QMS documentation can be represented as a hierarchy as shown in the diagram below:

FIG.7 QMS DOCUMENTATION HIERARCHY

ISO 9001 requires different types of information to be documented; however, not all information needs to be documented as separate documents. It is flexible so that the organization to decide on the size of the documentation and the level of details documented. For example, small companies can have documented procedures that will be included in the QMS manual.

How to structure your QMS documentation

The international standard ISO 10013:2001 Guidelines for quality management system documentation gives directions for effective dimensioning of the QMS documentation, as well as an overview of recommended contents and structure

of the different QMS document types. The following recommendations take into consideration the ISO 10013 guidelines.

1) Quality manual. The manual should fit your organization. The structure and the content of the manual can vary depending on the size of the organization, the complexity of operations, and the competence of the personnel. Small organizations can document the entire QMS in one manual. On the other side, large international organizations may have several different quality manuals. Generally, the manual includes the QMS scope, exclusions from the standard, references to relevant documents, and the business process model. The quality policy and the objectives can be part of the manual as well.
The quality manual should include most of following elements: title and table of contents; scope of the QMS; exclusions from ISO 9001, versioning information and approval; quality policy and objectives; QMS description, the business process model of the organization; definition of responsibilities for all personnel; references to relevant documents and relevant appendices. More information on how to document an effective quality manual can be found in this article: Writing a short Quality Manual.

2) Quality policy. A policy represents a declarative statement by an organization. A Quality policy should state the commitment of the organization to quality and continual improvement. Usually, this policy is used for promotional purposes and should be displayed in the organization's premises and posted on websites, so a clear and short quality policy is convenient and is the general practice.
The Quality policy defines the quality objectives to which the organization strives. The quality goals of organizations are defined by quantifying the quality objectives.

3) Quality procedures. Quality procedures can have different formats and structures. They can be narrative, i.e., described through text; they can be more structured by using tables; they can be more illustrative, i.e., flow charts; or they can be any combination of the above.
Quality procedures should include the following elements:

- Title – for identification of the procedure;
- Purpose – describing the rationale behind the procedure;

- Scope – to explain what aspects will be covered in the procedure, and which aspects will not be covered;
- Responsibilities and authorities of all people/functions included in any part the procedure;
- Records that result from the activities described in the procedure should be defined and listed;
- Document control – identification of changes, date of review, approval and version of the document should be included in accordance with the established practice for document control;
- Description of activities – this is the main section of the procedure; it relates all the other elements of the procedure and describes what should be done, by whom and how, when and where. In some cases, "why" should be clarified as well. Additionally, the inputs and the outputs of the activities should be explained, including the needed resources.
- Appendices may be included, if needed.

4) Work instructions. Work instructions can be part of a procedure, or they can be referenced in a procedure. Generally, work instructions have a similar structure to the procedures and cover the same elements; however, the work instructions include details of activities that need to be realized, focusing on the sequencing of the steps, tools, and methods to be used and required accuracy.
Training of personnel and use of competent personnel can decrease the need for highly detailed work instructions. More detail on this topic can be found in Using Competence, Training and Awareness to Replace Documentation in your QMS.

Good QMS documentation is essential for an effective quality management system

Dimensioning the QMS documentation based on your organizational needs is essential for a functional QMS. Moreover, properly structured documentation will make your operations much easier, while incorrect documentation will bring you nothing but trouble. Click here to download a white paper: Checklist of Mandatory Documentation Required by ISO 9001:2015, with more detailed information on the most common ways to structure and implement mandatory documents and records

QUALITY RELATED TRAINING

What is quality training?

Quality Training. Any program that teaches one how to test products to ensure that they are not defective. **Quality training** shows one how to investigate the procedures used to make a product, the knowledge of employees or even intangibles like company morale

What is a quality certificate?
Quality Certification is a general term that is used for two main things: certifying the knowledge of individuals and certifying a company's system of **quality** management.

What are the 3 types of training?
Being familiar with these basic **types** helps teams focus and more easily land on the structure of the curriculum, especially when I point out that there are really only **three types** of employee **training** that they need to address— new job **training**, developmental opportunities, and transitional **training**.

What are the three levels of training?
While several different approaches can be used to identify the **training** needs of an organisation, McGhee and Thayer's **Three-Level** Analysis is the most commonly used. The model provides a systematic means of conducting a TNA at **three levels**: organisational, operational (or task), and individual (or person).

What are the types of training programs?
There are several **types** of employee **training programs**. Employees may receive basic literacy **training**, interpersonal skills **training**, technical **training**, problem-solving **training** and diversity or sensitivity **training**. Each **type of training** targets a **different** facet of an organization's overall culture and performance.

5 Important Trainings That A Quality Engineer Should Take Up
Quality engineers have a task that is solely dependent on the overall aesthetic and integrity of the product or project. The weight of their task is so enormous that handling them poorly or withholding training that they need in order to save cost would be a bad choice. Quality engineers need to be equipped with modern and up-to-date knowledge. As the construction industry continually expand nowadays, so must the standards and specifications alongside it.

I remember one time there was a call from an HR asking if I had a “training certificate” of an international standard. I was lucky that I could answer “Yes!” Because at that time, I already have the training he was looking for. You can also reply with a “Yes,” if you are prepared. And in my opinion, this is the way how a quality engineer could double his job offer , because having the right training will definitely boost your career, in fact, it’s called a “career booster.” If you visit my about me page, you can see what training I have done.

So, without further ado, here are some of the most common training that quality engineers can get to upgrade their knowledge and boost their career

When a quality engineer gets a Lead Auditor ISO 9001:2015 certification, it means that he or she is a globally certified individual who can lead audit teams because they understands the specifications, principles, and standards of auditing. This means, an ISO 9001:2015 Lead Auditor could efficiently do auditing works from the examination, asking the proper questions, to evaluation and creation of effective reports, to knowing any inadequacy and deficiencies a quality system has.

Furthermore, if you are ISO 9001:2015 Lead Auditor certified, it means that you meet and pass the examinations given by any certification body and that you have in-depth knowledge of the ISO 9001 specifications and standards and how they can be effectively applied in the audit context.

This can be applied within the project in day-to-day activities from documentation processes to site construction activities. A set of qualifications are required for a professional engineer to get one. If you are interested, it is advised that you study the currently published ISO 9001:2015 version before attending the course.

2. Certified Quality Engineer (CQE), American Standard for Quality (ASQ)

Certified Quality Engineers, duly named by the American Standard for Quality are professionals who thoroughly understand the principles of output product and service quality evaluating and controlling. Getting one of these certificates shows that you will be able to understand the principles of efficiently developing and operating a quality system control, and analyzing and applying the inspection and testing procedures. Further, you will be equipped with proper methodologies for extracting data from statistical records, in order to determine and diagnose improper or correct practices in quality control. In addition, you will understand and know the factors that affect motivations. You will also be able to familiarize yourself with the concept of costs related to quality and

techniques and to audit departments or systems for any inadequacy or deficiency for corrections.

3. Applied Project Management (PMP) – A Guide to the Project Management Body of Knowledge. The Project Management Body of Knowledge, commonly known as PMBoK, is a collection of manual or processes, knowledge and idea areas which are universally accepted to be effective and are even deemed to be the best practices in project management. This manual was realized by the Project Management Institute or PMI as a result of actively documenting results from multiple actual project management examples. This is a field in the construction industry in which quality engineers should be knowledgeable, because they also relate to workers, materials, cost and timeline.

Engineers equipped with this training are expected to be able to take calculated and minimal risk, that pertains to project management. If you are able to get this qualification, it shows that you are capable enough to work around with acceptable, traditional, and good practices. Mostly, engineers who are working on construction projects are the ones who ought to take up this training, including engineers from supervision consultant up to Project Management Consultant (PMC).

4. OSHA (Occupational Safety and Health Administration)

The Occupational Safety and Health Administration, commonly known as OSHA, is a United States based agency under the Department of Labor. This agency ensures healthy working conditions and a safe working environment by enforcing requirements, qualifications, and standards. They also provide workplace safety and health training.

By pursuing or getting this qualification, you will be certified to enforce safety and health-related standards in the construction industry. This task of safety officers or personnel are most relevant for this qualification in the day-to-day construction workplace. In fact, no construction projects will commence without defined safety and health standards and regulations. This has to be set ahead of everything else as health, welfare, and the lives of people are at stake if left compromised.

5. Six Sigma Green Belt Certification (CSSGB)

If you are a certified Six Sigma Green Belt, it means that you are a person who professionally demonstrates and as duly knowledgeable in the Six Sigma processes and tools. Six Sigma is a globally known set of guidelines, laid down

and presented by the American Society of Quality, or ASQ. Normally, this Six Sigma Green Belt exam is multiple choice, meaning it is narrated and interactive course for the examiners to determine your level of understanding the context or exam.

Before taking or pursuing the CSSGB, furthermore, there are several related training courses that you may explore should you want to like Design of Experiments, Lean for Services and others.

Quality Engineer Tips

• You should take up ISO 9001:2015 Lead Auditor Training in order to know more about the quality management system. If you want to take this up later because of an important reason, I recommend reading the ISO 9001:2015 and have an advanced study guide.

• You should consider Certified Quality Engineer (CQE) training. I took this qualification after a few months of taking Lead Auditor Training. This was the textbook we used during the training. The same thing applies – you are advised to have an advance copy of the book.

• Project Management Body of Knowledge was the 3rd qualification I got. For Quality Engineer, I recommend getting this training after ISO and CQE. To give you insights, we've studied almost all management positions in the project. Whether it be project management, construction management, procurement management, quality management and so on, having a Project Management book as a guide while you are preparing to take up the training could be an advantage.

• For project managers or construction managers, this training is a "Must." You could also consider having the Project Management Templates, as this will ensure you have a good management template for your project. For project engineers and site engineers, if you decide to get this training, it would be a good advantage for you to learn in advance.

These are some but not all qualifications that quality engineers can get. If properly trained and equipped with all of these qualifications, then without a doubt, potential employers will see you as someone who understands efficiency and better construction standard

n general, some of the training courses mentioned above must be taken also by other project staff, mainly project managers, construction managers, procurement staff, and others. The Project Management or PMP training is best suited for them. This course mainly discusses management, and there are some lessons in quality management as well as about Safety on site

IMPLEMENTING A QUALITY SYSTEM

The steps required for the conceptualization and implementation of a QMS include the following:

Define and Map Your Processes. ...
Define Your **Quality** Policy. ...
Define Your **Quality** Objectives. ...
Develop Metrics to Track and Monitor CSF Data. ...
Define Defects for Every Process. ...
Develop Documents and Records. ...
Define **Quality** Process.

What is quality implementation?

"A QMS is a coordinated set of values and processes **implemented** by an organisation to ensure and demonstrate that it meets the standards demanded to satisfy its customers' demands and expectations."

What are the benefits of implementing a quality management system?

Advantages of quality management systems

greater efficiency and less waste.
better and consistent control of major business processes.
a better understanding of customer needs.
regulation of successful working practices.
improved risk management.
increased customer satisfaction.
improved participation of employees.
better internal communication.

Implementing a Quality Management System: Best Practice

Implementing a quality management system is as much an art as it is a science.

It takes data, but it also requires the ability to engage people. It takes methodological approach, but is also requires creativity.

In this article Qualsys' Business Mentors Mike Bendall and Peter Pond discuss implementing a quality management system and answer your frequently asked questions.

With experience implementing and consulting with organisations of all sizes, they offer an expert perspective on successfully implementing a new quality management system.

Learn:

- what a Quality Management System is
- why it is important to all organisations who want to succeed
- the benefits of implementing a quality management system
- the requirements of a QMS
- about operating a QMS in a highly regulated environment
- the importance of a hierarchical culture
- steps to implementation

The Ultimate Guide to Implementing a Quality Management System In Your Company. Do you have a Quality Management System your company can bank on? A stellar system that is helping you win the race against your competitors? If not, you are losing money and customers every day.
Picture this:

You have a fantastic product but your competitors are a step ahead of you. You have dedicated fans interested in buying from you, yet your competitors steal a few more away each month. You're left wondering what could be wrong? Your product, marketing strategy, and customer rapport are top notch. And even when you try a new approach, you don't see a better ROI. What if I tell you that a quality Management System (QMS) must be put in place in your company to be able to keep your competitors on their toes? With it, you'll be able to outline how your company wants to produce, document, control, and deliver your products and services in ways that will meet the requirements of your customers. In this guide, I'll be taking you through the A-Z of Quality Management Systems (QMS), and offering an extremely valuable worksheet that will help you implement QMS in your company.

Here's what you'll learn in the guide:
Chapter 1: Quality Management System: How It All Started

Chapter 2: Getting Started: The Elements and Requirements of a Quality Management System
Chapter 3: Quality Standards and Methodologies: What You Need To Know About The International Organization for Standardization (ISO)
Chapter 4: The Step-by-Step Guide To Creating and Implementing QMS In Your Organization
Chapter 5: Want to Succeed With QMS? Here Are Quality Management Principles You Must Imbue In Your Company
Chapter 6: How Quality Management Systems (QMS) Work In Different Industries

Quality Management System: How It All Started

People pay for and expect a quality product.
Paying customers stick with a brand because the company has proven it produces quality products and stands behind them.
To succeed in business, you need your customers to be happy with your products and thrilled to recommend them to others.
So, while your company keeps up with product innovations, it also needs to satisfy the ever-changing requirements of customers.

Enter Quality Management

Quality Management System (QMS): What It Is All About

A Quality Management System (QMS) is an important process that you must put in place in your company.
A QMS basically takes a critical look at the set of policies, processes, and procedures in a company. It helps you to plan and execute the core business areas of your company such as production, development, and service.
If you want customers to always come to you for more, then make "quality management" the watchword in your company. Doing so will ensure that your products and services are consistent with your company's goals. This will push you to maintain the desired level of excellence.
In the video below you'll learn more about the importance of quality and why you need someone to manage this in your company
According to this article, quality can be traced back to centuries ago when craftsmen began organizing into unions called guilds that people could trust to produce quality goods.

During the Industrial Revolution, workers were grouped together into factories and businesses, meaning that best practices were more important to maintain quality. During that period, the quality of a product was determined by inspection. This involved the measuring, examining, and testing of products against requirements put in place to make sure that each element followed the guidelines.

This tactic worked for a good while. However, as businesses grew and expanded, greater numbers of products were manufactured. As a result, companies experienced difficulties in following through with quality control standards, signaling the need for a change.

Enter industry experts like Deming, Dodge, Juran, and Romig who implemented these changes in the 1940s marking the beginning of Total Quality Management (TQM). With TQM, inspections were carried out by production personnel, and they did this by inspecting the products during specific production intervals. This changed the focus of quality from simply inspecting the end product to preventing end product problems by detecting them earlier in the production line.

World War II led to QMS becoming even more important. This was largely due to the mass production of military hardware – guns and bullets, vehicle parts, and so on. Military equipment needed to be checked thoroughly in order to ensure that the quality was maintained. For instance, bullets made in one state had to work with rifles made in another. During this period, the armed forces initially inspected virtually every unit of product. However, to make the process easier and also not compromise the quality, the military began to use quality techniques of sampling for inspection.

After the war, the importance of quality grew. This is because Japan enjoyed a quality revolution which improved the bad reputation it was known for in the past. It achieved this with the input of American thinkers like Juran and Deming who advised a shift in focus from inspection to improving all organizational processes. Throughout the 50s and 60s, Japan's quality focus was on ensuring that manufacturers produced increasingly higher-quality goods at lower prices. It was during this period that Japan became the hub of quality products, beating the U.S. at their own production game, and by the 1970s, the U.S. industrial sectors such as electronics and automobiles had been broadsided by Japan's high-quality competition.

When this happened, the American economy suffered from its inability to compete on quality with Japan. This compelled the U.S. corporate leaders to

step up their game. Their response led to the birth of the concept of Total Quality Management (TQM), which set the stage for quality to flourish and operational excellence to become renowned in the U.S. With this, the management of companies and its employees were concerned about their customers, ensuring that they were satisfied and remained loyal. When independent organizations began producing standards in the late 20th century to assist in the creation and implementation of quality management systems, the phrase "Total Quality Management" began to fall out of favor, and the term "Quality Management System" or "QMS" became preferred. Hence, leading to the creation of QMS.

What a Modern QMS Does For Your Business

A well-thought-out and documented QMS will help your business immensely. These are some of the benefits that your company will derive from implementing QMS.

FIG.8 IMAGE CREDIT: DINA DAVIDSON

1. Simplify

With a QMS, you'll be able to simplify:

- Customer requirements
- Customer satisfaction

- Your company's processes for improvements
- Your company's requirements in terms of effective and efficient use of resources
- Internal communication
- Prevention of product defects

When these areas are sorted, your company's efficiency increases, making it easier for you to reach the goals you've set for the company's growth.

2. Clarify

When you have a QMS in place, it will become easy to clarify the following:

- Roles and responsibilities
- Compliance with standards and regulations
- Internal processes of production/service rendering
- The path for staff training

Removing the gray areas will ensure that your employees remain focused as they won't be confused about their roles and responsibilities and how to best serve the company.

3. Control

In addition to simplifying and clarifying, you will be able to do the following in your company with a QMS:

- Ensure your company's commitment to its vision and mission
- Drive greater consistency in product quality
- Ensure continuous improvement

With greater control over your business, you'll be able to document your company's processes, procedures, and practices easily, securing greater success in the long run.

Those are the biggest benefits of the QMS, but it offers other benefits too; here's a video for additional info

Juran's Quality Trilogy: What It Means For Businesses

FIG.9 IMAGE CREDIT: WHATISSIXSIGMA.NET

Joseph M. Juran, a management consultant, and engineer developed and wrote the quality trilogy which became famous among qualified experts.

According to him, for any company to succeed with quality management, it must have the three phases of quality planning, quality control, and quality improvement in place.

The first phase, quality planning, entails activities that must be done to adhere to the vision, mission, and goals of the company and also conform to customer and compliance requirements.

After this, the next step is to control.

The company must put in place mechanisms to ensure that everyone adheres to the quality procedure. To be able to do this, you'll carry out periodic checks and inspections to meet the target.

Finally, there's a need to constantly improve on the quality. So, the company must conduct adequate research to know what its customers want and satisfy them always.

This will help to identify areas for improvement from the existing performance levels and devise means and ways to achieve the new targets and implement them successfully.

Are you ready to kick off the Quality Management System (QMS) in your company?
In the next chapter, I'll be taking you through the elements and requirements of a QMS.

Getting Started: The Elements And Requirements Of A Quality Management System

If you want to implement any system in your company, you must understand and put in place the elements and requirements needed to achieve tremendous success. The same is applicable to a QMS.
In this chapter, I'll be giving you a breakdown of these, so that you can build a solid foundation with it, and start the implementation process in your business on a high note.

Elements and requirements of a QMS

The elements and requirements of a QMS serve as the foundation on which the QMS in your company stands. Picture these elements and requirements as the guides which you need before you can start the implementation of a QMS in your company. These include all the activities that your company uses to direct, control, and coordinate quality. And these are designed to be applicable to any company in any industry

Quality policy:

The first element of a QMS in any company is a quality policy. You need to craft a meaningful quality policy that spells out in specific terms what you mean by quality in your company. With this document, your employees and customers will know the direction of your company management with respect to quality.

2. Quality objectives:

After identifying the policy direction of quality in your company, you need to outline what you want to achieve with it.
The objectives highlight the goals for the quality of products, services, and processes. Unlike a quality policy that is set at the top level of a company, these can be specific to a department, team, process, or project. Some examples include Timeliness, Availability, Safety, and Customer Service.

3. Quality manual:

Having a quality manual in place is a no-brainer. It helps you to fully describe the scope of the QMS, and communicate what you want to achieve by emphasizing quality throughout your organization.

With it, you'll be able to explain all the requirements of the quality standard you're using. It is also used to describe all the QMS processes that you undergo in your company.

4. Organizational structure and responsibilities:

As stated earlier, a QMS helps in clarifying the structure of a company.

Here, you'll highlight how your company is structured from management to the staff. Likewise, you'll explain the responsibilities that are expected to be carried out by each person.

5. Data management:

According to Techopedia, data management refers to how an organization manages information and data for secure and structured access and storage.

It's all about gathering, handling, transmitting, and protecting customer and company data in line with privacy laws which can vary from state to state and between countries.

6. Processes – including purchasing:

Processes are the backbone of quality management – this includes everything from best practices to safety and hygiene. You need to document everything carefully.

If an error occurs, it becomes easy for you to identify where the problem is coming from and the department in which it occurred, making it easy for you to correct it.

7. Product quality leading to customer satisfaction:

It's only when you have a quality product that you can satisfy your customers.

With a quality product, you have a better chance of retaining your present customers.

8. Continuous improvement including corrective and preventive action:

This is about efficiency, appropriateness, managing tech changes, and so on. When mistakes occur in your process, this helps you to correct and prevent these actions. By doing this, you'll find it easy to improve your products.

9. Quality instruments:

You need to have tools in your company that enhance the quality of your products and meet the standards of the industry.

It's only when you have quality tools that you can produce quality products.

10. Document control:

Document control helps you to enforce controlled processes and practices within your company. It deals with the creation, review, modification, issuance, distribution, and accessibility of documents in a company.

Having a document control will help you to approve documents by ensuring that they are adequate before issuing them. You'll also be able to update as necessary and re-approve documents if needed.

With the foundations in place, you're on the verge of achieving amazing results. Here's an example of what a QMS can do for you

In the U.S. and most parts of the world, the Apple brand is known for its quality. For this reason, whenever a new product is to be released from the company, thousands of users queue up in technology stores and malls to get theirs.

The reliability of Apple's quality has enabled them to sell over 821 million iPhones in the U.S. since 2007 according to this report.

You might be wondering, why does an average technology user trust the Apple brand? How did the brand grow to become so trusted? What strategy does the company use to become dear to the hearts of users?

Of course, this didn't happen overnight. For years, Apple invested time and resources to develop the company's Quality Management System.

Over time, it has put in place policies that ensure the company matches its customers' ideology. Quality, in this case, is as much about how the customer perceives the product as it is about manufacturing precision.

For instance, Apple has a procurement policy that requires the following from each of its suppliers.

- First, Apple expects its suppliers to meet the highest standards for all goods and services.

- Next, they pay close attention to the company's culture and expectations. In this way, Apple prioritizes suppliers who look for ways to add value.

- Finally, due to the competitive and fast-paced business environment, Apple values suppliers that are innovative.

As you can see, when developing a QMS in your company, you'll face a lot of challenges.

In the next subsection, I'll mention the most common ones, and show you what to do to work around them.

The Biggest QMS Obstacles and How to Avoid Them

One thing is sure, you'll encounter hurdles when developing a QMS in your company.

Here are some of the most common challenges, and what you need to do to save time and energy when encountering issues.

1. Strive for perfection:

Truth is, there's no perfect QMS anywhere. By striving for perfection, you might get bogged down in details instead of implementing the "best possible" solution so that you have something to build on. Remember, continuous improvement is built into a QMS, so it will take place over time.

2. Unnecessary documentation:

Organizations have a lot of documents that they end up losing count of. This affects the output and productivity of the employees in the long run. However, you should note that the objective of a QMS isn't to create paperwork, rather it is to communicate the right information appropriately. Although, if you require piles of documents in your industry, then you may need to summarize and refer to complete versions.

3. Rigid nature of QMS:

You might create a QMS that is not flexible. If it's too hard to change a procedure in a QMS, it may not work effectively. If your QMS is like that, it will be difficult to improve when necessary. Work in flexibility to avoid it's not helping you to achieve the best results in the future.

Since Customer requirements and companies are constantly evolving, there is a need for the QMS to evolve as well. You need to improve it from time to time so that it can keep up with the changes your company goes through. This will improve your performance and help you to seize new opportunities.

4. Lack of motivation:

Sometimes, a company decides to develop a QMS due to external factors, without carrying its staff along. When this happens, there's usually a "them and us" atmosphere in the company. Since reluctance usually comes from fear of losing jobs, having to do more work, and retraining, it's better to inform all members of staff and management about the next steps you want to take with your QMS. Keep everyone on board and involved to keep them motivated.

Talk to everyone involved, let them know why you must implement QMS in your company, and make sure they understand that it's about efficiency, making their jobs easier, and getting better results.

They'll be motivated to support it, and see it succeed.

5. Little or no attention to customers:

If you're not careful, being focused on QMS processes instead of results will mire you in documenting and organizing, forgetting the goal of the QMS—to satisfy customers.

No level of quality is sufficient if your customers aren't satisfied. You must invest time and resources to hear from your customers, communicate with them, and see how far you'll go with your QMS.

In the next chapter, I'll be introducing you to the International Organization for Standardization (ISO), the body recognized globally for evaluating quality. The ISO sets up the quality agenda that companies around the world follow.

Quality Standards and Methodologies: What You Need To Know About The International Organization for Standardization (ISO)

The International Organization for Standardisation (ISO) is "an independent, non-governmental international organization with a membership of 162 national standards bodies."

The ISO gives world-class specifications for products, services, and systems, ensuring their quality, safety, and efficiency.

It officially began operations on 23rd February 1947

nternationally, ISO 9001 is the QMS standard which many forward-thinking companies strive to meet.

How to get ISO 9001 Certified

Most companies use ISO 9001 because it's an international standard with well-established guidelines and global acceptance.

If you're well-prepared and understand what's required for ISO 9001 certification, you can be done with this process within three to six months depending on your company's size and complexity.

- The first step, which is very important, is to have an experienced person within or outside the company who knows and understands what's needed to achieve ISO 9001 certification.

- Your expert will come up with an ISO 9001 Quality Manual instrumental for the Stage 1 audit based on the requirement set by the body. During the Stage 1 audit, an external assessor/auditor will check to be sure that your written Quality Management system meets the required ISO 9001 Standard.

- Once this is done, areas of deficiency and the expected improvement of the system will be highlighted by the auditor. Your company will be expected to make the suggested changes to qualify for the next stage.

- If this is done, you'll then be qualified for the Stage 2 Certification Assessment. In this stage, the assessor/auditor will check to be sure that you're working to the requirements of Quality Management Systems and the ISO 9001 Standard. This can be done by an independent 3rd party or a UKAS Accredited Certification Body.

Here are some things you must put in place in your company to achieve the ISO 9001 Certification faster.

1. A clear idea of what you stand to gain:

This is crucial. You must be sure from the outset of the objectives and benefits your company will achieve through ISO 9001 certification.

2. A documented QMS:

You need to have a QMS in place, as well as the policies and procedures required by ISO 9001.

The documentation will define the following:

- Company structure
- Who's in charge of recording information and what information is recorded
- What is expected of employees

- How communication is done in the company
- What actions are required
- How continuity will be maintained as staff change

3. A well-defined QMS Process:

You need to define your QMS process too. However, this will be done with the necessary input from all the departments in the company.

In doing this, you will have to:

- Define who your customers are for each department. For example, your IT department's customers include everyone in your organization using computers or other IT equipment.
- Document the activities in each area.
- Review the ISO 9001 Standard to ensure the requirements have been met.
- Identify any problem areas and rectify them.

4. Manage the documentation appropriately:

It's necessary to communicate with all of your staff and let them know why they should keep records and use the appropriate documentation.

When you do this, you'll be able to control the use of documents and ensure that the latest version is in use, which is important for ISO 9001 Certification.

In doing this, you'll remove the old versions, replace them with the new ones, and distribute to the various internal departments.

This will ensure ease of access to the documents, as there will be central storage that everyone will have access to.

5. Put in place corrective and preventive measures:

It's possible for processes to go wrong. When this happens, you need to have a system in place that fixes the problem, identify where things went wrong, then make changes to prevent these issues from happening again. In doing this, you should take note of what you did to rectify this problem.

6. Continuous support and training:

You must train your staff so that they'll carry out their job specifications effectively. To do this, you should take note of their past experiences, education, and training. This helps them adapt to changes with new procedures

and potentially new roles and responsibilities. You should also check to ensure that your staff actually read and learn these new procedures.

7. Audit your quality internally on a regular basis:
ISO does annual surveillance audits, though they recommend yearly internal audits as well (or more frequently for crucial or high-risk processes). So, you need to audit your own system internally. To do this, you may need employees within your company who are independent of the function being audited.
What the internal auditor does is to check that procedures in the quality manual are followed to the letter, and identify areas that need to be rectified.

OTHER QUALITY MANAGEMENT SYSTEMS (The Different Methodologies to Managing Quality):
Here are some other ways to manage quality in your company.

1. Cost of Quality (COQ):
Cost of Quality (COQ) is a QMS methodology that you can use in your company to know exactly the amount of resources that you need to prevent poor quality of your products or services. With COQ, you'll be able to determine what your company stands to gain when it implements process improvements.
Quality-related activities that incur costs include prevention costs, appraisal costs, and internal and external failure costs.

2. Total Quality Management (TQM):
TQM is a QMS management approach that ensures that quality is emphasized throughout the entire business process. It focuses mainly on developing quality products and services on a long-term basis by highlighting each process and activity individually. By doing this, it will know those processes that contribute immensely or those that detract from the quality goals of the company.
If any process is found to be deviant, the TQM will align it with the company's goals, values, and beliefs.

3. Kaizen:
Kaizen is a Japanese word for "improvement." It is a QMS approach that is used for creating improvement in a company based on the idea that small, ongoing positive changes can lead to major improvements.

It was developed in the manufacturing sector to promote innovation, cut-out waste, increase productivity, and encourage worker purpose and accountability. Today, due to its numerous interpretations, other industries such as healthcare utilize it too.

4. Six Sigma:

Six Sigma is a data-driven and disciplined QMS approach which emphasizes perfection in quality. It applies specifically outlined processes to improve the business process and reduce deviation too.

Multimillion dollar companies such as Motorola and General Electric use Six Sigma as a QMS.

5. EFQM Excellence Model:

The EFQM Excellence Model (European Foundation for Quality Management) is the most widely used continuous improvement tool in the world. Any company can use it, irrespective of size or sector. What the model does is to allow companies to evaluate their current performance so that they will identify strengths as well as areas they for improvement.

Apart from internal quality improvement, it can also be used to achieve external quality recognition.

6. Corrective Action Report (CAR):

Corrective Action Report (CAR) is a QMS procedure used to initiate corrective action. It is used to respond to a defect. Simply, it's an action carried out in the company to prevent a particular problem from occurring again.

What it does is to investigate a problem that occurred, carry out a root cause analysis using various tools, and come up with a resolution to prevent the recurrence.

For instance, CAR can be used to eliminate the cause of a detected nonconformity (when a product or service does not conform to a certain specification of the standards). While you can have more than one nonconformity, Corrective Action will be taken to prevent a said nonconformance from happening again.

7. Continuous Quality Improvement (CQI):

CQI is a QMS that is never satisfied. It lays more emphasis on the role that teams and individuals play in relation to quality. While it focuses more on the

constant improvement of quality, it pays less attention to the processes and functions.

It also has a “Plan, Do, Check, Act” approach that fits into many companies and industries that have adopted it.

Depending on your company and industry, there are different QMS methodologies as stated above. Pick the one that fits your company (unless you want ISO certification) in order to evaluate quality in your company.

In the next chapter, I’ll walk you through how to implement a QMS in your company.

The Step-by-Step Guide To Implementing a QMS In Your Organization

Having covered the basics you need to know about QMS, let’s look closely at implementing one of these systems in your company. When taking this crucial step, your aim should be to do it the right way in order to achieve great results.

In this chapter, I’ll be taking you through the seamless process of the implementation of a QMS.

Implementing A QMS: The QMS Implementation Process

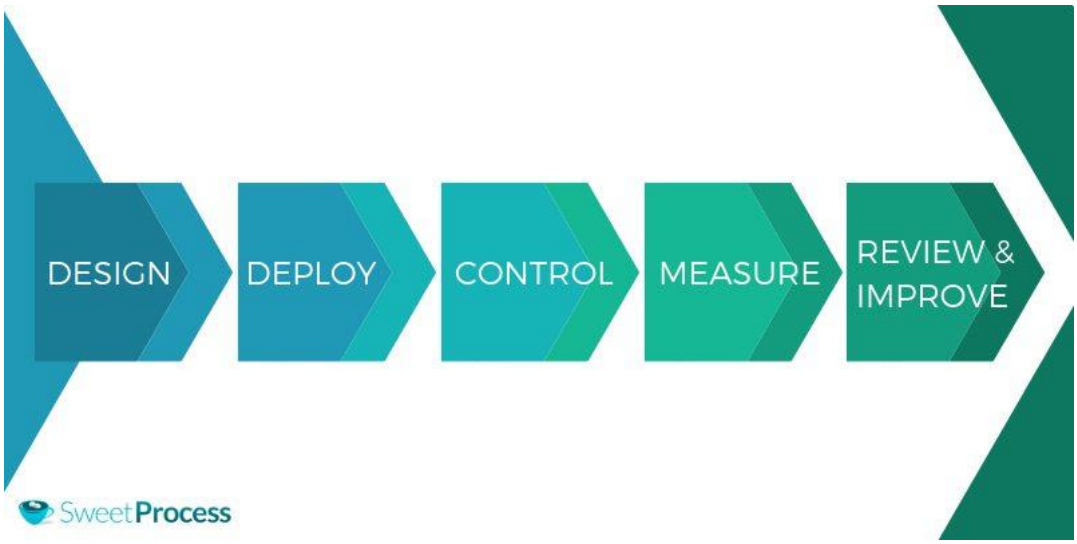

FIG.10 QMS IMPLEMENTATION PROCESS

The overall goal of establishing a QMS is customer satisfaction. So, if you’re implementing this system in your company, these are the steps you’ll have to follow:

1. Design:

When implementing a QMS, designing it is the first process you must carry out. Here you need to choose the methodology that suits the business, list the stakeholders, plan your timelines, decide if you're going for (or need) a certification, and gather existing documents.

For this to be effective, you'll have to define the structure of the QMS as mentioned previously. Then, you'll map out a strategy that makes it easy for you to follow the implementation plan.

Similarly, you should put up all the general templates that your company plans to use for this process. For each of the templates, the procedures and instructions should include information on purpose, scope, and who is responsible for implementation.

2. Deployment:

If you already have procedures in place in your company that encompass design, you can start from this step. However, you must ensure that the procedures which you have in place are up-to-date and align with your goals and objectives.

Here, you're talking about cloud access, printed manuals, and training. You also need to educate and enlighten your employees through a combination of documentation, education, training, tools, systems, and metrics.

If, for instance, you're a large company operating in different countries, you might consider translating the documents into different languages.

3. Control and measure:

When controlling your QMS, you need to map your QMS documents and structure according to the established hierarchy in your company using the process/document maps and organization charts. To do this effectively, you should draft documents based on what you have in the document maps; understand your audience and address them appropriately.

On the other hand, measurement of a QMS is to determine the effectiveness and efficiency of each process towards attaining its objectives.

Some of the things you need to measure include how complete the policy definition is, what your business covers, how QMS reflects your company's policies, where to deploy your QMS, how to use it effectively, and its relevance to the job in hand.

When measuring, you should ensure that the process used in the document control and measurement is the same as that used in the drafting process.

4. Review and Improve:

This is the final step in the QMS implementation process.

All you need to do here is review the QMS so as to communicate the findings to your employees. This step is important for your company because this is where subject matter experts from areas affected by the document scope in different departments review the documents.

When this is done, they will know which areas meet the QMS standard as outlined by the company, and those areas that need to be improved. However, if you don't review the documents, it may result in the compliance being reduced, increase the risk of deviation from the QMS, and cause problems between staff/departments.

After reviewing the documents, it's also important to improve what you have, based on the suggestions made by the subject matter experts in various departments. Doing this helps your company finalize and perfect your system before it's finally subjected to the review of the regulatory bodies.

With the steps highlighted above, you'll find it seamless to create and implement a QMS in your company.

In the next chapter, I'll introduce you to some principles that can make or mar the implementation of QMS in your company.

Want to Succeed With QMS? Here Are Quality Management Principles You Must Imbue In Your Company

Quality management principles, as explained by the International Standard Organization, are a set of fundamental beliefs, norms, rules, and values that are accepted as true and can be used as a basis for quality management.

It's a critical aspect of QMS, and its implementation or otherwise can make or mar the aims and objectives set out by your company.

In this chapter, I'll be taking you through some quality management principles you want to ingrain in your company.

1. Customer Focus:

This is the basis for success with QMS in any company.

You must ensure that your QMS is focused on your customers, and is targeted at making them fall in love with your products.

If you're not careful, you'll be caught up in the QMS as a standalone project and forget the end goal.

Benefits of customer focus to your company:

- Increase in revenue and market share
- Effective use of the company's resources to enhance customer satisfaction
- Make customers loyal to you, leading to repeat business
- Expand your customer base
- Better reputation for your company

Actions you must take to apply this principle in your company:

- Research and understand the needs of your customers and their expectations
- Communicate the needs of your customer throughout the company
- Measure the satisfaction of your customers
- Manage your company's relationship with customers
- Ensure a balanced approach between satisfying customers and other interested parties (such as owners, employees, suppliers, financiers, local communities and society as a whole)

Image Source: StartupNation

FIG.11 CUSTOMER RELATIONSHIP

2. Leadership:

Experienced and dedicated leaders are essential for the success of a QMS in any company.

This is because as the head of the company, you show your employees what you want them to achieve. And when they trust and admire you, you're able to direct, drive, encourage, and show them the way.

Benefits of leadership to your company:

- Increased effectiveness and efficiency in meeting the company's quality objectives
- Improved communication in the company between staff and management
- Better coordination of the processes in the company
- Development of the company's ability to achieve desired results

Actions you must take to apply this principle in your company:

- Communicate the company's mission, vision, strategy, and policies companywide
- Establish a culture of trust and integrity in the company
- Encourage the commitment of your employees to quality
- Ensure that leaders at all departments are positive examples to everyone in the company
- Inspire, encourage, and recognize people's contribution to the growth of your company

3. Engagement

Any QMS that doesn't involve the staff at all levels will fail sooner or later.

That is why you need to engage as many people as you can when creating and implementing a QMS in your company.

To be able to do this effectively, use and value the abilities of employees.

Benefits of engagement to your company:

- Improved understanding of the company's quality objectives by the staff and customers
- Active involvement of employees in what you do
- Enhanced satisfaction of the stakeholders

- Increased attention to shared values and culture throughout the company

Actions you must take to apply this principle in your company:

- Conduct surveys to examine the satisfaction of customers, communicate the results, and take appropriate actions
- Communicate with employees to let them know the importance of their individual contribution
- Promote partnership throughout the company
- Facilitate open discussion in the company

Having a process in place is necessary for the implementation of QMS to succeed within a company.

This is because, it involves all the critical aspects of a company such as managing activities as processes, deploying resources effectively and linking them to various activities, and measuring how individual activities will succeed in a company.

The process approach is a principle you must imbue in your company.

Benefits of a process approach to your company:

- Enhanced ability to focus the company's efforts on key processes and opportunities for improvement
- Continuous and predictable outcomes through a system of aligned processes
- Optimized performance through effective process management and efficient use of resources
- Ensuring that the organization inspires confidence in interested parties

Actions you must take to apply this principle in your company:

- Define the objectives of the system and processes you must put in place to achieve them
- Understand the capabilities of your company and determine resource constraints prior to action
- Manage processes and their interrelations as a system to achieve the company's quality objectives
- Make the necessary information available in order to operate and improve the processes
- Manage risks that can affect the overall outcomes of the QMS

5. Improvement:

You need to improve on your products on a continuous basis, for QMS to work in your company.

If you want to get this right in your company, you need to improve organizational performance and capabilities, celebrate notable improvements by your staff, and measure the improvements on a consistent basis.

Benefits of improvement to your company:

- It enhances process performance, company's capabilities, and customer satisfaction
- It makes it easy for you to expect and react appropriately to internal and external risks
- It helps you learn more about what your customers want
- It drives you to be more innovative in your approach

Actions you must take to apply this principle in your company:

- Promote the creation of improvement objectives at all levels of the company
- Educate and train employees at all levels on how to achieve specific objectives in the company
- Ensure that people are competent to successfully promote and complete improvement projects

6. Evidence-based Decision Making:

One thing you must do when implementing a QMS in your company is you must make many decisions.

However, the best form of decisions you could make is the one which relies on verifiable facts and evidence.

Ensuring that accurate and reliable data is accessible, using appropriate methods to analyze data, making decisions based on the analysis, and ensuring that you balance it up with practical experience is the way to go in making this a reality.

Benefits of evidence-based decision making to your company:

- It enhances the decision-making processes in the company

- It improves operational effectiveness and efficiency
- It increases the ability to review, challenge, and change opinions and decisions
- It helps you demonstrate the effectiveness of past decisions

Actions you must take to apply this principle in your company:

- Make decisions and take actions based on evidence only, then balance it up with experience and intuition
- Ensure that the relevant people who need data have it
- Make sure that data and information are accurate, reliable and secure
- Improve the competence of your employees to analyze and evaluate data as needed

7. Relationship Management:

Managing relationships help you to succeed in business. This is needed even more when implementing a QMS since you'll be working and collaborating with a lot of people.

When you manage relationships, you relate to concerned stakeholders in your company, know their fears, and attend to their needs.

Some relationship management tips include: optimizing resources, establishing long-lasting relationships with partners, and actively acknowledging your employees, suppliers, and those who make your business work.

Benefits of relationship management to your company:

- It enhances the company's performance as it relates to interested persons and parties
- It makes it easy for interested parties to understand the company's goals and objectives better
- It increases the capability to create value for interested parties by sharing resources and competence with them
- It provides a stable flow of goods and services through a well-supervised supply chain

Actions you must take to apply this principle in your company:

- Determine relevant interested parties (such as suppliers, partners, customers, investors, employees, and society as a whole) and their relationship to the company
- Gather and share information, expertise, and resources with relevant interested parties
- Measure the company's performance and provide feedback to interested parties, as appropriate
- Establish the development and improvement of activities with suppliers, partners and other interested parties
- Encourage and recognize improvements and achievements by the company's suppliers and partners

These principles can be used as a framework to guide you towards improved performance in your company.
The next chapter will take you through how the QMS works in different industries.

How Quality Management Systems (QMS) Work In Different Industries

As mentioned previously, the QMS can be implemented in any industry.
In this chapter, I'll explain how QMS works in different industries, and what it entails for each of them.

QMS in the Pharmaceutical Industry:

In the pharmaceutical industry, the common QMS typically relies on key regulations that the Food and Drug Administration (FDA) enforces.
The big focus here is on manufacturing which includes hygiene, quality control, and adherence to FDA regulations.
It also encourages companies to take actions to correct any anomaly that arises from any of these indicators of quality in the industry
SO/TS 16949 is a Technical Specification from ISO for the automotive industry. It's one of the most common industry-specific standards.
For any automotive company to attain this, it must specify what it requires for the design/development, production, and where relevant, installation and servicing of its products. The safety, quality of parts used, and design controls are also emphasized here.

The International Automotive Task Force (IATF) authored it, in conjunction with participating members from the private sector and regulatory agencies
In the food industry, consideration is given to the activities that a company adheres to and risks it may encounter before a QMS can be approved.
FDA requirements, ISO quality regulations (such as ISO 22000), and similar regulatory standards of "effectiveness and efficiency" are needed to evaluate a company's food safety quality processes.
Companies are expected to make use of the right tools and ensure they have a QMS in their company. Key issues such as food handling, packaging, cooking, distribution, and temperature controls are all checked for here.

Industries with no specific QMS:
The International Organization for Standardization (ISO) uses the ISO 9001 as the standard for companies with no specific QMS.
Basically, it involves the identification of activities and tasks required to maintain the desired standard in these industries. Since these industries don't have a specific regulation, they stand to benefit from the ISO 9001 to guarantee quality.
The hotel, hospitality, and service industries are some of those which use this standard.
This is an example of the industry where only guidelines are provided. The guideline for QMS in this industry are voluntary, and not intended for certification or accreditation. Rather, it provides a framework for the design and improvement of process-based quality management systems by healthcare organizations.
The ISO guidelines for QMS in the healthcare industry are based on ISO 9004:2000, Quality management systems – Guidelines for performance improvements, and the basis for it is to ensure that the patient comes first.

Conclusion:
As important as the Quality Management System (QMS) is for every company at each growth stage, most business owners still find it difficult to implement.
They think it is an expensive marketing strategy for the likes of Apple, Samsung, and Ford. Or they believe that it's too much work, complex, and the ROI isn't worth it at the end of the day.

In fact, a QMS is vitally important for any company. You'll be able to consistently:

- Meet customer requirements
- Manage internal requirements
- Manage the effective allocation of resources

Similarly, the gains of implementing this system in any company are many, which include:

- Achieve company goals
- Market your business more effectively
- Boost customer satisfaction
- Improve the availability and accuracy of documents
- Create a culture of quality
- Communicate better with your employees
- Measure the performance of individuals and teams; and
- Improve compliance

To effectively implement QMS in your company, all you need to do is follow a series of actionable steps.

First, you need to gather information about your customer requirements.

Next, document and improve your processes to meet and exceed those requirements.

Finally, you implement what you arrive at in any aspect of your business.

While implementing this system may appear a herculean task at the outset, the benefits outweigh the work involved to set up a viable QMS. The good news is that I have created this valuable QMS implementation worksheet that will walk you through the steps you must take now to implement this critical system in your business

QUALITY SYSTEM STANDARD

What are quality standards?

Quality standards are defined as documents that provide **requirements**, specifications, guidelines, or characteristics that can be used consistently to ensure that materials, products, processes, and services are fit for their purpose

What are quality management system standards?

Quality management standards are details of requirements, specifications, guidelines and characteristics that products, services and processes should consistently meet in order to ensure: their **quality** matches expectations. they are fit for purpose. they meet the needs of their users.

WHAT ARE QUALITY STANDARDS

Quality standards are defined as documents that provide requirements, specifications, guidelines, or characteristics that can be used consistently to ensure that materials, products, processes, and services are fit for their purpose. Standards provide organizations with the shared vision, understanding, procedures, and vocabulary needed to meet the expectations of their stakeholders. Because standards present precise descriptions and terminology, they offer an objective and authoritative basis for organizations and consumers around the world to communicate and conduct business.

FIG.12 COMPONENTS OF QUALITY STANDARDS

WHO USES QUALITY STANDARDS?

Organizations turn to standards for guidelines, definitions, and procedures that help them achieve objectives such as:

- Satisfying their customers' quality requirements
- Ensuring their products and services are safe
- Complying with regulations
- Meeting environmental objectives
- Protecting products against climatic or other adverse conditions
- Ensuring that internal processes are defined and controlled

Use of quality standards is voluntary, but may be expected by certain groups of stakeholders. Additionally, some organizations or government agencies may require suppliers and partners to use a specific standard as a condition of doing business.

ASQ QUALITY STANDARDS

WHAT'S NEW IN ISO STANDARDS?

ISO 19011:2018

The 2018 revision of ISO 19011, the international standard that specifies guidelines for auditing management systems and managing an audit program, is available. **Purchase ASQ/ANSI/ISO 19011:2018.**

ISO 9001:2015 and ISO 9000:2015

The 2015 revisions of ISO 9001, the international standard that specifies quality management systems (QMS) requirements, and ISO 9000, which provides fundamental QMS concepts, principles, and vocabulary, are available. **Purchase ASQ/ANSI/ISO 9001:2015 and ASQ/ANSI/ISO 9000:2015.**

ISO 14001:2015

The 2015 revision of ISO 14001, the international standard that specifies requirements for environmental management systems, is available. **Purchase ASQ/ANSI/ISO 14001:2015.**

WHY ARE STANDARDS IMPORTANT?

For businesses: Standards are important to the bottom line of every organization. Successful companies recognize standards as business tools that should be managed alongside quality, safety, intellectual property, and

environmental policies. Standardization leads to lower costs by reducing redundancy, minimizing errors or recalls, and reducing time to market.

For the global economy: Businesses and organizations complying to quality standards helps products, services, and personnel cross borders and also ensures that products manufactured in one country can be sold and used in another.

For consumers: Many quality management standards provide safeguards for users of products and services, but standardization can also make consumers' lives simpler. A product or service based on an international standard will be compatible with more products or services worldwide, which increases the number of choices available across the globe

How do you establish quality standards?

Here are 6 steps to develop a quality control process:

Set your quality standards. ...

Decide which quality standards to focus on. ...

Create operational processes to deliver quality. ...

Review your results. ...

Get feedback. ...

Make improvements.

THIRD PARTY CERTIFICATION

Third party certification is an extremely important part of the **construction** industry. **Certification** means that an independent organisation has reviewed the manufacturing process of a particular product. It has been independently determined that the final product complies with safety, quality and performance standards

What is a third party certification?

Third-party certification means that an independent organization has reviewed the manufacturing process of a product and has independently determined that the final product complies with specific standards for safety, quality or performance

What is Third Party Certification Authority?

A **Certificate Authority** is a trusted **third party** entity that issues digital **certificates** and manages the public keys and credentials for data encryption for the end user. ... These customers require **certificates**, which their servers can be configured to use for secure communication with their visitors.

What is the Value of Third Party Certification in the Construction Industry?

Third Party Certification for structural products has never been more important. Claire Curtis-Thomas, Chief Executive of the BBA explains the extensive testing process BBA Approved products go through to ensure customers can buy with confidence. In recent years the choice of building products in every sector has mushroomed as alternatives, including low cost Chinese look-alikes, have flooded onto the market, creating more choice but leaving buyers with very little security with regards to performance.

This scenario led many reputable manufacturers to seek third party certification and in the UK that inevitably means achieving the coveted BBA mark. To understand more about the value of certification, we invited Claire Curtis-Thomas, CEO of the BBA to introduce it in more detail and outline the challenges which lie ahead.

How did the BBA originate?

The Agrément Board was formed as a government department in 1966 following a period when local authority purchasing was deemed to be failing to select products of appropriate quality. BBA was set up to assess the performance of these products and local authorities were then limited to only buying products that had been assessed. A big change came in the 80's when BBA started working for private companies. So now the BBA is supplying a range of services and has the formidable challenge in terms of communicating with multiple communities, helping them understand the value that certification brings.

Today almost 200 people work within the BBA; including engineers, scientists and technicians. There is not a specialism that we don't cover. We have the privilege to work with companies like Keystone, who are enormously innovative and saying to them "right, how do we help you to get your innovative products onto the market, to give them the credibility they deserve from an impartial authority like the BBA."

Do you test everything in-house?

We carry out hundreds of tests at our extensive onsite facility, however, there may be some tests that we can't carry out, in which case we sub-contract those and of course, advise our clients. For example, we don't do any fire testing in-

house, but fortunately the BRE fire test house is based between two of our testing properties, so everything can be handled very efficiently. We have very good relationships with all the fire facilities and we use their expertise to augment our own and they do the same.

We are now regarded as global experts in many of the areas that we cover. Our staff sit on British Standard Committees and also European Standard Committees. We are part of a global network of companies enabling us to undertake global projects together. At the moment we're working on magnesium oxide boards. Obviously, we've been working recently on external wall insulation as its performance is an issue with global impact. If problems are identified then we will get together and decide what needs to be done, and then seek to influence the development of legislation in different countries to ensure that we've got a comparable global standard.

Is a BBA certification only recognised in the UK?
No. BBA certification is recognised globally. So, in addition to Europe, we have huge market profiles in the Middle East. We're also known in many Commonwealth countries. British certification is still highly valued, particularly in countries in which Britain had previous involvement. Qatar would be an example in the Middle East where the BBA were specified in government contracts for the 2020 World Cup stadiums. They wanted BBA certification and expressed their trust in the certification process which gives them confidence when purchasing the BBA certified products for this massive scheme. I'm off to the Middle East before the end of the year, and will be visiting some of the buildings where BBA products have been used, so I'm really looking forward to that. I get an enormous sense of pride when I see products that have been assessed by us and then used in beautiful buildings where they are doing the jobs that we said they could do.

What does third party certification mean?
Third party certification is absolutely vital because if it wasn't there then people would be left to effectively declare their own performances, and in the world that we live in today that is simply not good enough. It's about having an organisation that can lead the way in terms of expertise; standing up and proclaiming the qualities of that product on behalf of that company and doing so unequivocally.

Who are you engaging with in the construction market?
We are talking to government departments every week; we're talking to local authorities, housing associations, insurance companies, lenders, everybody and anybody who is connected to construction. They're talking to us because they want impartial and independent advice on product procurement, and about the emerging landscape in construction. They may also want to know that if they're going to invest in new construction technologies that they are right to have confidence in those technologies.

What value does third party certification bring manufacturing businesses?
What it means for you as a business is that you don't have to defend your product or seek to persuade people about the adequacy of its performance, because what you can say to them is "we have a BBA certification for this product", and you've achieved your objective of credibility. BBA certification conveys a message about the quality, performance and durability of the product and about where your product stands relative to loads of other products. Without this third party certification you can still go to market and claim "we're better than the competition" but, of course, the first thing the buyers will say is "prove it".

What do customers gain when they buy a BBA certified product?
Customers can buy with confidence, so they know what they're getting. If I look at the Keystone literature, it's about endorsements from your customers, and they are choosing to buy your products because they are quality, outstandingly good products and fit for purpose, but they are also products backed by third party certification, so customers can trust them.

What is next for the BBA?
We have certified five and a half thousand products, so our products are everywhere. Currently our certifications are reviewed every 3 years maximum and we want our certificates to be up-to-date with current regulations on the very day you look at them. To meet this challenge we need to reconfigure how we hold and manage data, so we can connect with government departments, enabling any changes in the rules and regulations to be fed straight into our certification.

We are working on a system which will automatically flag up when something is out of date, so we can immediately advise our clients to make sure that that product is brought back up to spec and complies with all the current regulations. We want to connect our databases to global databases. We want to be able to extend the advice to architects and specifiers so that we're offering not just information about a product but we're looking at how that product actually works with other products.

Architects are now looking for more comprehensive solutions, where they can be informed about all the other products that are needed for a building detail and have confidence that all the parts involved are equally well certificated. Specifiers and architects are also telling us they would like our certifications to include installation specifications for the products. So this is a great challenge but because we are a non-profit distributing company we reinvest all our profits into R&D activities, so this is a big research and development project for us and it's one we're going to be working on over the next 3 years

Third Party Certification Benefits Contractors and the Construction Industry

As constructors working in the largest profession in the United States, we have a responsibility to effectively manage billions of dollars of work for our clients and to ensure that their projects are constructed on time, on budget, safely and in a quality manner. This requires professionals who have the needed skills and knowledge and the willingness to accept the technical and ethical obligations associated with their responsibilities. While state licensing for architects and engineers provides an increase level of assurance to clients that their projects will be designed to meet their needs and protect the safety of the public, certification can do the same for constructors.

As every client is aware, if a project is to be designed and constructed to meet their needs, no matter what project delivery method is used, without a team of qualified designers and constructors, working collaboratively with the client, problems in meeting project goals are inevitable. Unfortunately, there is a poor perception of design and constructor professional's qualifications by each other in the industry, which continues to serve as a hindrance towards achieving a truly collaborative team effort. That is why it is critical for constructors to attain professional qualifications equivalent of those of architects and engineers.

There was clearly a need for a national third-party professional qualification for managers of the construction process. In 1994, representatives of major

construction associations and industry executives joined forces to build a certification process. Their goal was to develop a process that was applicable no matter the type or size of the construction company, or the type of project delivery method. The resulting organization was the American Institute of Constructors' Constructor Certification commission. The Commission embarked on the development of a two-level national constructor certification process.Working with a major national test development organization, two certifications were developed which required individuals to meet specified educational and experiential qualifications and passing a comprehensive examination.

The first level — **Associate Constructor** (AC) — recognizes individuals who have earned an undergraduate degree in construction management from an accredited college or university or have attained approved construction experience with or without some formal education and have passed a comprehensive examination over the foundational skills and knowledge needed of an entry level manager of the construction process.

The second level — **Certified Professional Constructor** (CPC) — recognizes individuals who have earned an undergraduate degree in construction management and have at least four years of experience in the management of a construction project or a minimum of eight years in the case of not having the degree and pass a comprehensive examination over the application of the foundational skills and knowledge needed to effectively manage the construction process. The CPC qualification is considered nationally to be an equivalent professional qualification to licensing of architects and engineers.

While the CPC certification is relatively new as compared to how long state licensing of architects and contractors has existed, it is becoming more recognized and accepted by the construction industry as the only third-party national certification for all types and sizes of general and specialty construction contractors no matter the type of project delivery method. Those construction companies who support and reward those in their firms who have achieved the CPC qualification have found the examination to be an effective independent assessment of an employee's skills and knowledge; improves company marketability to clients and provides added assurance that employees will continue to improve their skills and knowledge.

In addition, many owners and public entities are recognizing the benefits of the CPC certification. For example, Clemson University and Texas A&M are now

placing language in their Requests for Qualifications and/or Request for Proposal documents indicating preference in their contractor selection method for those companies who will have CPCs as part of their project management teams. The states of Oklahoma and Texas contractor licensing boards recognize the CPC qualification as acceptable to perform construction management work in their respective states. Progress continues to be made at the Federal Government level and their acceptance and recognition of the CPC certification.The bottom line is that owners are experiencing that having CPC's on their management teams provides an added level of assurance that their projects are being managed in a more professional and ethical manner.

The benefits for the individual CPCs are many, including enhancing their image as a professional to clients, their employers and the public and improving their career opportunities by setting themselves apart from those not having the certification. A recent study of CPCs found that one-third indicated attaining the qualification helped them become promoted; 20% realized increases in their compensation packages; and 20% felt an increase in respect from their peers, employers and clients as a construction professional.

Constructor certification indicates which construction professional has met the educational and professional standards needed to uphold the obligations of the profession. If you currently are in a project management-related position and not certified, I encourage you to do so. Becoming certified enhances the image of our entire profession and raises the bar of professional practice in our industry. For more information about constructor certification go to www.professionalconstructor.org.

What Is Third-Party Certification?

Third-party certification means that an independent organization has reviewed the manufacturing process of a product and has independently determined that the final product complies with specific standards for safety, quality or performance. This review typically includes comprehensive formulation/material reviews, testing and facility inspections. Most certified products bear the certifier's mark on their packaging to help consumers and other buyers make educated purchasing decisions.

NSF Certification

Recognized by regulatory agencies at the local, state, federal and international level, NSF certification demonstrates that a product complies with all standard requirements. NSF conducts periodic facility audits and product testing to verify

that the product continues to comply with the standard. See the complete NSF product listings.

NSF's programs include testing and certifying drinking water treatment products and water filters, commercial foodservice equipment and a wide array of consumer products such as bottled water, nutritional supplements, private label goods, personal care items and home appliances (washers, dryers and dishwashers).

Why Do Companies Seek NSF Certification?

Independent, third-party testing and certification through NSF helps organizations:

- Demonstrate compliance with national or international standards and regulations
- Demonstrate independent validation and verification of their commitment to safety and quality. Increase credibility and acceptance with retailers, consumers and regulators Benefit from enhanced product quality and safety.

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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF CIVIL ENGINEERING

UNIT – II– QUALITY POLICY – SCI 1614

Quality policy – Objectives and methods In Construction Industry – Consumer's satisfaction, Economics -Time of Completion – Statistical tolerance -Taguchi's concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures – Processes and products – Total QA I QC program and cost implication.

QUALITY POLICY

A **quality policy** is a brief statement that aligns with your organization's purpose and strategic direction, provides a framework for **quality** objectives, and includes a commitment to meet applicable requirements (ISO 9001, customer, statutory or regulatory) as well as to continually improve

How do you write a quality policy?

How to Write a Good Quality Policy

- The Quality Policy should be the Goal of the Organization. ...
- Start with Customer Requirements. ...
- Collect Inputs of Internal Parties. ...
- Include Required Information of ISO 9001. ...
- Write and Communicate the Quality Policy.

What is quality policy and objectives?

ISO 9000:2008 **Quality Policy** (Sec 4.1).

It is a brief statement or document that defines your **quality** goals and **objectives**, a commitment. Click for Sample. to meeting them as well as continuous improvement. It should provide an outline for creating, stating, and measuring your performance of the **quality objectives**.

What is a quality policy and why is it important?

Quality policy is an **important** aspect of **quality** management implementation in an organization. According to BuisnessDictionary.com, **Quality Policy** is top management's expression of its intentions, direction, and aims regarding **quality** of its products and processes.

What should a quality policy contain?

The **quality policy should** build on corporate objectives and values and be appropriate to the purpose and context of the organization. The **policy should** demonstrate a commitment to continual improvement. The **quality policy must** be communicated, understood and applied thoughout the oraganisation

Quality Policy - How to Write & Communicate your Policy Statement

What is an ISO quality policy? Top Management is responsible for establishing, reviewing and maintaining the quality policy and quality objectives. The quality policy should build on corporate objectives and values and be appropriate to the purpose and context of the organization. The policy should demonstrate a commitment to continual improvement. The quality policy must be communicated, understood and applied though out the organization.

What is a Quality Policy and Why is it Important?

Ensure you have a well written quality policy statement.

The quality policy is often know by other names such as:

- Mission statement
- Vision
- Strategic concept

- Charter
- Statement of principles

Part of the reason why you need a well written quality policy statement is to ensure your employees understand that their job affects product quality and quality control, and therefore the success of the company. Employees must be made aware that their individual contribution is important to the company's overall success and commitment to quality.

TABLE 1 COMPARING ISO 9001:2015 WITH ISO 9001:2008

ISO 9001:2015		ISO 9001:2008		Summary of Changes
5.2	Quality Policy	5.3	Quality Policy	Includes an **additional requirement** to make the policy available to interested parties and being available as documented information
5.2.1	Establishing the Quality Policy	5.3	Quality Policy	
5.2.2	Communicating the Quality Policy	5.5.3	Internal Communication	

How do you Write a Quality Policy?

Align the Quality Policy with Strategy

ISO 9001:2015 now requires your organization's quality policy and resulting objectives to be appropriate to your organization's strategic direction and operational direction (context). This means that once your organization has determined its context and the relevant requirements of its interested parties, Top Management must review the quality policy and objectives, in light of this new information, to ensure continued relevance. Your organization will need to understand and identify all the influences that affect its business and ensure that the strategy and direction takes this into consideration. Your organization will need to review its current quality policy as necessary to ensure that any changes in context, interested parties or their requirements is reflected in the policy, and to determine whether your organization's objectives are affected (Refer to ISO 9001:2015 - 6.2.1a).

Please find below a number of quality policy statement examples.

Quality Policy Statement (example 1)

Company XYZ provides quality management, co-ordination, production and processing, manufacture and installation services throughout the UK and sometimes abroad. The Company has developed its expertise since its establishment and its aim is to achieve a high standard of construction and service to its customers. It is the policy of Company XYZ to provide the customer with goods and services to the agreed requirement in accordance with the details and price. The Directors, Management and Staff are responsible for Quality Control through the Quality Management System seeking improvement by constant review, with suppliers and sub-contractors being encouraged to co-operate. The Company is committed to achieving customer satisfaction by the

use of quality procedures which will be operated to meet or exceed the requirements of ISO 9001

5.2.1 Establishing the Quality Policy

This requirements for quality policies is comparable to the requirements of ISO 9001:2008 Clause 5.3 – Quality Policy. You should check that there is evidence that Top Management have participated in the creation of the quality policy, and are reviewing and maintaining it. The standard requires you should review the quality policy to determine whether the quality policy is appropriate to the context of the organization and its purpose (and set quality objectives), that there is a commitment to continually improving the QMS, and the quality objectives are consistent with the quality policy. Top Management should demonstrate that the quality management statement is compatible with the strategic direction and context of the organization, as required by Clause 5.1.1b.

Top Management must ensure their commitment to quality and that the quality policy:

- Is appropriate to the organisation and ISO implementation
- Includes a commitment to requirements and continual improvement
- Provides a basis for establishing and quality objectives
- Is communicated and understood within the organisation (staff training)
- Is periodically reviewed for suitability

Go for something short, sweet and memorable

OBJECTIVES AND METHODS IN CONSTRUCTION INDUSTRY

Objectives of **Construction** Project Planning. Planning comprises defining **objectives** of the project, sequence of works, **construction methods**, planning of resources, preparing estimation, and durations for various activities to bring about the satisfactory completion of project

What is construction methods and its importance?

Modern **methods** of **construction** are defined as a **construction** process that makes use of traditional and new building materials by using either an offsite manufacturing process or an onsite **method** of combining 'systems' (building **techniques**) and 'components' (parts of a building

What are the 3 types of construction?

In general, there are **three** sectors of **construction**: buildings, infrastructure and industrial. **Building construction** is usually further divided into residential and non-residentia

What is means and methods in construction?

Means and Methods of **Construction** — a term used in **construction** to describe the techniques and tactics (usually temporary structures) a contractor employs to complete **construction** of a permanent project or structure.

Objectives and performance in construction projects

Abstract

This paper considers the problems associated with the identification and use of project-related objectives held by a project-owning, client organization. It is argued that the evaluation of projects, contractors, professionals or procurement methods solely on the extent to which client objectives are achieved is

problematic. Difficulties include setting objectives at an appropriate level, allowing for uncertainty and inter dependencies between objectives, and measuring the achievement of objectives. Proper evaluation and improvements in performance require an examination not just of project objectives but also of the processes involved in pursuing them.

Objectives of Construction Management

Objectives of Construction Management: If one is going to practice management within an industry, it is a good idea to define the arena in which the management techniques will be applied. We really need to know just what business we are in to evaluate our present goals, find out where we have been, and where we hope to go from here. A construction manager is someone who plans, coordinates, budgets, and supervises construction projects from early development to completion. The theme of this article is the practice of management across all facets of construction project execution. Therefore, construction technology will be introduced only as it, bears on total construction project management. It is a given that you must master the basic technology applicable to your specialized field of construction before you can effectively take on the total management of a construction project.

Objectives of Construction Management

The objectives of construction management: Construction management is a professional service that provides a project's owner(s) with effective management of the project's schedule, cost, quality, safety, scope, and function. Construction management is compatible with all project delivery methods. No matter the setting, a Construction Manager's (CMs) responsibility is to the owner and to a successful project. At its core, a capital project is made up of three parties (excluding the CM):

- The owner, who commissions the project and either fund the project directly or finances it through a variety of methods.
- The architect/engineer, who designs the project.
- The general contractor, who oversees day-to-day operations and manages subcontractor

Objectives of Construction Management

Construction managers, also called general contractors or project managers, typically do the following:

Professional CMs use industry-standard practices to manage projects successfully. The CM Body of Knowledge and Standards of Practice address all six areas of construction management services: schedule, cost, safety, quality, function, and scope.

- Prepare and negotiate cost estimates, budgets, and work timetables
- Select appropriate construction methods and strategies
- Interpret and explain contracts and technical information to workers and other professionals
- Report on work progress and budget matters to clients
- Collaborate with architects, engineers, and other construction and building specialists
- Instruct and supervise construction personnel and activities onsite
- Respond to work delays and other problems and emergencies
- Select, hire, and instruct laborers and subcontractors
- Comply with legal requirements, building and safety codes, and other regulations

customer what business we are in to evaluate our present goal

CONSUMERS SATISFACTION s,

CUSTOMER SATISFACTION IN CONSTRUCTION

Sami Kärnä[1], Juha-Matti Junnonen[2], and Jouko Kankainen[3]

ABSTRACT

Customer satisfaction can be seen either as a goal or as a measurement tool in the development of construction quality. This paper examines empirically performance of Finnish construction companies measured according to the degree of customer satisfaction as perceived by customers themselves. The purpose of the study is to explore empirically the clients´ main satisfaction/dissatisfaction factors. Empirical data is gathered from nearly 400 construction projects in Finland. The views of customer with respect to the performance of contractors are measured using five factors; quality assurance and handover, environment and safety at work, co-operation, personnel, site supervision and subcontracting.

Several implications regarding customer satisfaction were drawn from the findings of the research. Customers were typically satisfied with the contractor's abilities to co-operate and the skills of contractor's workers and supervisors. In contrast, low satisfaction could be found for the items related to quality assurance and handover procedures and material. The common feature for the areas of low satisfaction items is that they come out in later phases of the construction project. In generally, the quality of contracted work and of overall service level has an effect on general satisfaction.

KEY WORDS

Performance measurement, customer satisfaction, quality, construction.

find out where we have been, and where we hope to go from here

TAGUCHI'S CONCEPT OF QUALITY

AThe **Taguchi** method of **quality** control is an approach to engineering. It emphasizes the roles of research and development (R&D), product design and development in reducing the occurrence of defects and failures in manufactured goods.

TAGUCHI'S DEFINITION OF QUALITY

The old traditional definition of quality states quality is conformance to specifications. This definition was expanded by Joseph M. Juran (1904-) in

1974 and then by the American Society for Quality Control (ASQC) in 1983. Juran observed that "quality is fitness for use." The ASQC defined quality as" the totality of features and characteristics of a product or service that bear on its ability to satisfy given needs." Taguchi presented another definition of quality. His definition stressed the losses associated with a product.."

It must be kept in mind here that "society" includes both the manufacturer and the customer. Loss associated with function variability includes, for example, energy and time (problem fixing), and money (replacement cost of parts). Losses associated with harmful side effects could be market shares for the manufacturer and/or the physical effects, such as of the drug thalidomide, for the consumer

Taguchi Approach to Quality improvement

The term "quality" can be defined in different ways and it has different meanings to different people. However, in order to achieve quality, it is inevitable to have a definition for quality that will reflect the customer's needs and expectations. This book focuses on the definition and concept of quality advocated by Taguchi. Taguchi's approach to quality differs from that of other world-leading quality gurus such as Juran Deming Crosby and Feigenbaum. Taguchi foucuses more on the engineering aspects of quality rather than on management philosophy. He provides a method of achieving robustness (i.e. making insensitive to external variations) for products and processes, which is the key element for any organization to stay competitive in the world market.

QUALITY CODES AND STANDARDS

Quality standards are defined as documents that provide requirements, specifications, guidelines, or characteristics that can be used consistently to ensure that materials, products, processes, and services are fit for their purpose. co

What is quality code?

Code quality defines **code** that is good (high **quality**) and **code** that is bad (low **quality**). This **quality**, good, bad is all subjective. For that reason, we explain what is **code quality**, how to improve **code quality**, and how **code quality** tools can help.

What is the importance of quality standards?

Quality Standards Offer a Formula for Success. Clearly defined **standards** and **requirements** make it easier for companies to meet what their consumers consider "**quality**" and they improve the overall vision of what the company should work towards.

How are quality standards developed?

In general, **standards** are **developed** using a work group process or informal public meetings and are eventually proposed for public comment. States, territories and authorized tribes then begin a public participation process that includes public hearings regarding the proposed **standards**

What is the difference between quality and standard?

As adjectives the **difference between standard** and **quality**

is that **standard** is falling within an accepted range of size, amount, power, **quality**, etc while **quality** is being of good worth, well made, fit for purpose.

Chapter 7. Code Quality Standards

7.1. Motivation

Your primary goal in all programming endeavors should be to write code that is reusable without modification. The purpose of coding standards is to make the code easy to read and understand, by other programmers, and by yourself after being away from it for a time. Software specifications and evaluation criteria are generally categorized as function or non-functional. Functional criteria have to do with what the program is supposed to do (its function). The main question regarding functionality is whether it produces correct output given correct input. Non-functional criteria have to do with other qualities that are not apparent from the program's functionality. Is the code well documented? How efficient it is? There are hundreds of non-functional measures for software. A few of the most important ones are covered here.

The keys to readability are:

- Modularity: Code is broken into sections that are completely independent of each other, so that you can understand a block of code without looking at any other code.
- Cohesion: All code for a given task is in one block, with no other code intervening.

- Consistency: Code is written and formatted in a consistent manner, so that it is easy to browse. You can see clear patterns in the structure and indentation, so that you can quickly scan the code and find what you're looking for.

Poor code quality can lead to a multiplicative increase in development cost as programmers waste time trying to decipher and debug it. As the project grows, so does the difficulty in dealing with poor quality code. Execution speed is also important, but don't sacrifice readability and intuitiveness for a marginal increase in speed. Some of the standards in this document are universal truth, and others are arbitrary convention. You will encounter both kinds of standards in the programming profession (as well as some contradictions to universal truth). Each workplace has its own set of standards, which may conflict with each other and with this document. No two programmers will ever agree 100% on how code should be written and documented. It is more important that members of a team follow the same conventions, even though they may not agree with all of them, so that they can work effectively together. Accordingly, you will be graded on adherence to the standards described here, whether or not you completely agree with them. This will be good practice for your future career.

This document is a trivial example to introduce the concept of coding standards. When working for large organizations such as NASA, the FDA, or the military, coding standards may be hundreds of pages long. They will dictate how to format and document code, how to test code, how to document tests, how to secure code and test data, and much more. Adherence to these standards could make the difference between an A and a B in the course. However, if your grade in this class is your only reason for writing good code, you should seriously reconsider studying computer science. The point of coding standards is to make you a more productive programmer. They will help you get programs done faster and lead to more efficient and reliable code. This will help you and others who work with your code in the future. This should be your primary motivation for following any

standards. Code quality is about half the grade for programming assignments and is based on the factors described below

CONTRACT AND CONSTRUCTION PROGRAMMING

What is a contract Programme?

The **Contract Programme** is the single most important document that a **Contractor** is likely to submit between **contract** award and final account submission. It is the common platform against which project progress is monitored and the extent and causation of delay (and any related extension of time entitlement) is assessed

What's the difference between program and Programme?

In American English, **program** is the correct spelling. In Australian English, **program and programme** are both acceptable. In British English, **programme** is the preferred spelling, although **program** is often used in computing contexts

Programme for building design and construction

Programmes describe the sequence in which tasks must be carried out so that a project (or part of a project) can be completed on time.

Programmes will often identify:

- Dates and durations allocated to tasks.
- A critical path (the sequence of critical tasks upon which the overall duration of the programme is dependent).
- Tasks which can only be carried out after other tasks have been completed.
- Tasks which can be carried out simultaneously.

- 'Float' within tasks that are not on the critical path (that is, delays that can be incurred without affecting the critical path). Identifying float can be helpful in highlighting where it may be possible to transfer resources to tasks that are on the critical path.
- The need for specific resources such as plant, services or materials and their lead time.

Preparing a programme should not be a paper exercise that simply records what has already happened or what is likely to happen. For a programme to be effective, it must be used as a tool to help plan activities, monitor progress and identify where additional resources may be required.

Programmes can be prepared for a number of different purposes:

- The client's overall programme, which may include more than one project, activities leading up to, the appointment of consultants works outside the scope of the main contract (such as the supply of equipment), migration strategy, and an ongoing programme for operation and evaluation once the development is complete.
- Project programme: 'The overall period for the briefing, design, construction and post-completion activities of a project.' Ref RIBA Plan of Work 2013.
- A design programme scheduling tasks from the appointment of the consultant team to the appointment of the contractor. This might be a simple gantt chart incorporating each consultants planned resources for each stage which is then monitored and reported to the client.
- Information release schedules, setting out when the consultant team should issue production information to the contractor in order for the works to progress and when information produced by the contractor (or

their sub-contractors) should be issued to the consultant team for comment and integration into the overall design.

- The contractor's master programme, scheduling construction activities.
- Approvals programmes.
- Tender or procurement programmes.
- Manufacturing programmes.
- Delivery programmes.
- Installation programmes.
- Testing and commissioning programmes.
- Short-term look ahead programmes.

On large projects, the client may appoint a programme consultant to prepare a detailed programme for the project (including an outline programme for construction). Once the contractor is appointed, they will take responsibility for programming the works.

When preparing a programme, particular attention should be given to:

- Long-lead items.
- Pre-contract works (such as demolition or site clearance).
- Prefabricated elements.
- Works outside of main contract (such as work by statutory undertakers).
- Relationships with other projects.
- Phasing and sectional completion.
- The 'CDM planning period'. This is now a requirement of the CDM regulations, intended to allow contractors sufficient time to assess health and safety issues and plan their worksbefore commencing construction. Duty holders will need to ensure that time is allowed for this in the programme, both for the appointment of contractors and sub-contractors. The client must include details of the CDM planning period in pre-construction information.

- Decision points (gateways). Decision points often appear as milestones on programmes, with no consideration given to whether the individuals required to make the decision will be available, or how long it might take to make that decision. Wherever possible key client decisions should be programmed to take place at existing meetings, with briefing material issued in advance, enabling the client to make informed decisions.

The contractor's master programme is not part of the contract documents, and is not enforceable under all forms of contract. The completion date (and perhaps stage or sectional completion dates) are enforceable and failure of the contractor to meet the completion datemay lead to a claim by the client for liquidated damages.

Contracts will generally require that the contractor progresses the works regularly and diligentlyand failure of the contractor to meet the dates on the master programme might be evidence that this is not the case.

NB: The completion date indicated on the contractor's master programme may be earlier than the completion date entered into the contract.

A design programme defining deliverables might be incorporated into consultant's agreements, however, this is difficult to enforce (due in part to activities of third parties outside the consultant's control such as planning authorities, client or stakeholder actions, consultationprocesses, etc.), and generally, the only recourse the client has is to threaten termination for non-performance in the event of consistent programme failure.

NB The RIBA Plan of Work 2013 defines the construction programme as: 'The period in the Project Programme and the Building Contract for

the construction of the project, commencing on the site mobilisation date and ending at Practical Completion

INSPECTION PROCEDURE

What is inspection report in construction?

Sometimes referred to as a 'standard property **report**', a pre-purchase property **inspection report** is a written account of the condition of a property. It will tell you about any significant building defects or problems such as rising damp, movement in the walls (cracking), safety hazards or a faulty roof to name a few

What is the purpose of a site inspection?

A **site inspection** is a limited visual **inspection** of the Association's common area components. It is limited because it does not generally include invasive or destructive testing. The **purpose** of the **site inspection** is to generate information to support the funding plan of the Reserve Study report.

What is a checklist in construction?

Construction checklists allow you to link important elements in your **construction**project. **Construction checklists** detail specific information of activities and phases in your project. **Construction checklists** can categorise particular items, materials, equipment, tasks, etc

What are the types of inspection?

The Three Types of Quality Inspections

- Pre-production Inspection. During the pre-production phase, raw materials should be tested before entering production. ...

- In-line Inspection. Additional inspections should take place during various stages of production. ...
- Final Inspection.

What are the functions of inspection?

An **inspector** is a key person in the **inspection** process. In support of—and under the direction of—a quality professional, an **inspector** can use the proven techniques to evaluate hardware documentation, perform laboratory procedures, inspect products, measure process performance, record data, and prepare formal reports

What are the top 10 safety risks in construction?

The top ten risks and hazards from working on construction sites are:

- Working at height.
- Moving objects.
- Slips, trips, and falls.
- Noise.
- Hand arm vibration syndrome.
- Material and manual handling.
- Collapsing trenches.
- Asbestos.

Which one is function of inspection department?

The **Inspection Department** undertakes onsite **inspection**/investigation of insurers, intermediaries, insurance intermediaries and other organizations connected with insurance business to verify compliance to various regulations and other directions issued by the Authority and other applicable legal provisions.

What is stage inspection?

It is an **inspection** in the manufacturing process, and refers to the **inspection** performed in the final **stage** of manufacturing process. In the Final **Inspection**, the whole of the product including the requests from customers is **inspected**

Why is inspection needed?

It is **necessary** to assure confidence to manufacturer and aims satisfaction to customer. **Inspection** is an indispensable tool of modern manufacturing process. It helps to control quality, reduces manufacturing costs, eliminate scrap losses and assignable causes of defective work. ... It is the function of quality control.

5 Ways Construction Inspection Checklists will Improve Your Quality

A construction inspection checklist (also known as an inspection form) is like a road map. Both are condensed, thumbnail sketches of the real world … incomplete but highly useful. A road map can't show every trail, tree, hill and house … If it did, it wouldn't be useful. They are memory aids and save brainpower. Inspection checklists forms are much the same.

However, they are also much more … inspection checklists are **critical quality control tools** for the entire construction industry.

Here are 5 ways to use inspection checklists to improve construction quality:

Build Consensus

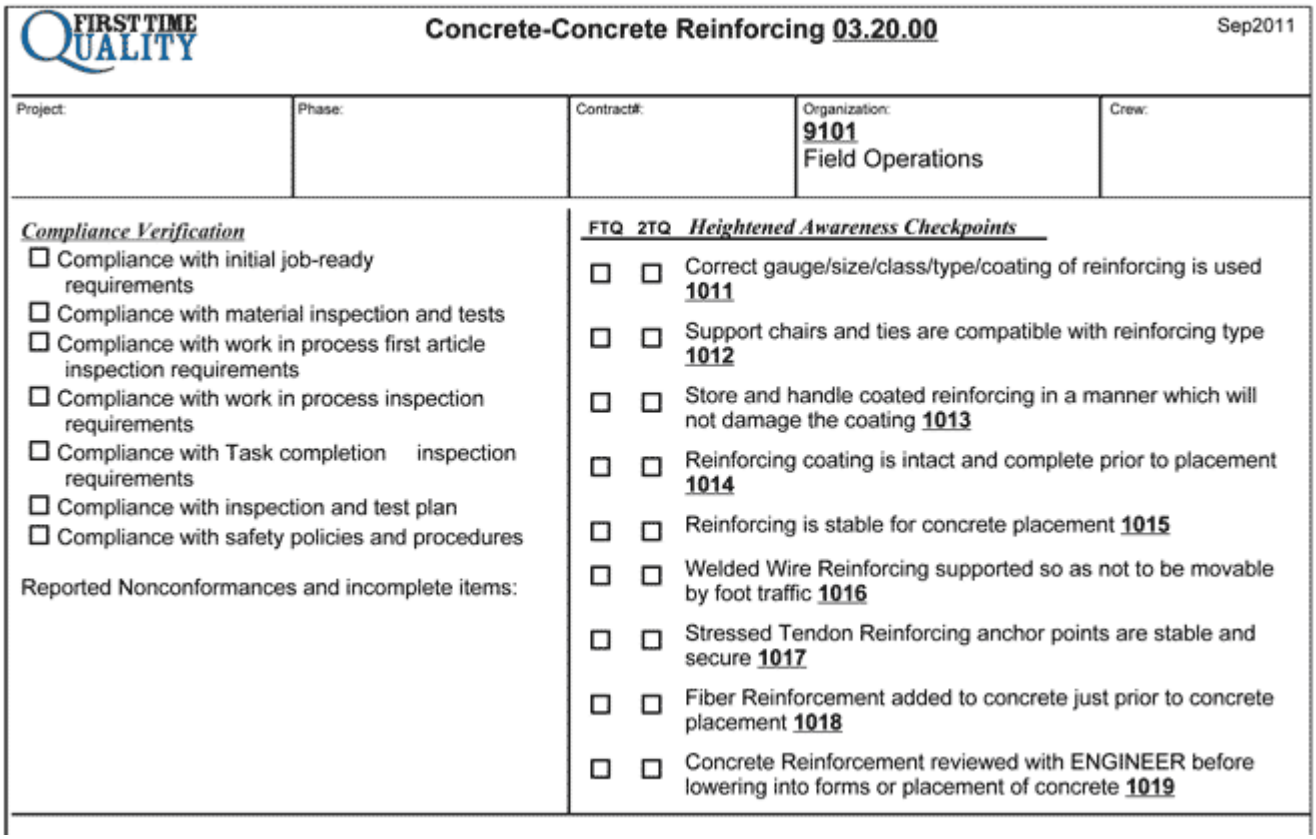
Inspection forms list critical quality concerns from a variety of stakeholders. Used to build consensus among all parties for the most important items to be done right and your inspection checklists will improve the success of the project. For example, let’s say you are building a regional shopping mall, with hundreds of millions of dollars at stake. As the general manager, owner, or general contractor you manage work being done by dozens of general contractors and perhaps hundreds of sub contractors. All have a serious interest in the quality of work being done. And, each has a unique expertise in his or her field.

By building consensus on the top checkpoints for your inspection forms and using them throughout your project, you'll communicate information that's critical to the project's success.

Reminders

As contractors begin their phases of work, they can review their checklists for important items to remember. At the end, contractors should close out their tasks by verifying that they have completed each checkpoint. Below is an example of a checklist for concrete reinforcing that is included with our Concrete Contractor Quality Plans.

TABLE 2 CONCRETE CONTRACTOR QUALITY PLAN



FIRST TIME QUALITY

Concrete-Concrete Reinforcing 03.20.00 Sep2011

Project:	Phase:	Contract#:	Organization: 9101 Field Operations	Crew:

Compliance Verification

- ☐ Compliance with initial job-ready requirements
- ☐ Compliance with material inspection and tests
- ☐ Compliance with work in process first article inspection requirements
- ☐ Compliance with work in process inspection requirements
- ☐ Compliance with Task completion inspection requirements
- ☐ Compliance with inspection and test plan
- ☐ Compliance with safety policies and procedures

Reported Nonconformances and incomplete items:

FTQ	2TQ	*Heightened Awareness Checkpoints*
☐	☐	Correct gauge/size/class/type/coating of reinforcing is used **1011**
☐	☐	Support chairs and ties are compatible with reinforcing type **1012**
☐	☐	Store and handle coated reinforcing in a manner which will not damage the coating **1013**
☐	☐	Reinforcing coating is intact and complete prior to placement **1014**
☐	☐	Reinforcing is stable for concrete placement **1015**
☐	☐	Welded Wire Reinforcing supported so as not to be movable by foot traffic **1016**
☐	☐	Stressed Tendon Reinforcing anchor points are stable and secure **1017**
☐	☐	Fiber Reinforcement added to concrete just prior to concrete placement **1018**
☐	☐	Concrete Reinforcement reviewed with ENGINEER before lowering into forms or placement of concrete **1019**

NOTE: Our checklists have about 10 or 15 heightened awareness checkpoints that list the most important items to check. I don't recommend more because that would dilute the importance of your top priority items.

Click on this link to see inspection checklist form examples from 16 CSI Master Spec Divisions.

Record of Compliance Verification

In addition to heightened awareness checkpoints, checklists should verify compliance to quality control policies and procedures. Sign-off of a checklist should occur only when the work complies with all of the relevant specifications. Other interested parties and stakeholders that inspect the completed work should use a similar approach for their purposes.

TABLE 3 RECORD OF COMPLIANCE

CLICK TO ENLARGE

Once completed, checklists can be a permanent record that critical details have been followed and the overall work conforms to specifications. Archived, they have legal (forensic) applications and can serve as exhibits in courts of law that demonstrate diligent quality controls were in place, even it there was a failure. Click on this link and download a Free Blank Inspection Form Template to create your own.

Identify Issues for Improvement

Any stakeholder can use the same inspection form to inspect the work. In essence, the completed inspection form is the voice of each inspector — each stakeholder that performs an inspection. It identifies gaps between their expectations and what they have found during their inspection. Superintendents and other QC personnel can use the same checklists that contractors and works crews used. Except this time, they're using the checklist to record the 2nd time

quality items they have found. And later, verify that those items have been fixed.

Tracking 2nd time quality checkpoints over time provides insight into how often a problem occurs and who the responsible contractor is. This information is the basis for targeting problems and making changes for improvement. Checklists also track the frequency of problems. So, once you've made some changes, you can see if your changes result in actual improvement.

Monitor Performance

General managers, owners, and general contractors can use checklist data for deciding which subcontractors provided the best ROI. An example might be: “This company was cheaper and did acceptable work, but quality issues held up other job phases for 8 days. We should have taken another bid.” The construction manager who made this decision may never have met the subcontractor or seen the subcontractor's work. Your inspection report tells the story and the manager can make the decision at his desk, looking at a computer screen. Subcontractor company owners can use the inspection report data to monitor work crew performance and make improvements before poor performance impacts future work opportunities.

In conclusion

While some people will successfully get where they want to go without using a map, construction companies won’t be as successful without using inspection checklists. Whether you choose to use paper or mobile/web inspection checklists, it’s clear, using construction inspection checklists will help you improve quality and the success of your project

PROCESSES AND PRODUCTS

Construction inspection: the pillar to your construction quality management

Other than looking out for the progress of your project and sending their updates to your stakeholders, the role of inspection also includes the careful examination of your construction works against quality and industry standards. How you conduct your quality inspections becomes the pillar of your construction quality management. And your company's quality management can dictate the overall quality of your project delivery.

The Difference Between Process and Product Layout Manufacturing

In an effort to make your production line more efficient, look at the different ways to lay out the production line or overall manufacturing plant. Two of the most common layouts are the process layout and the product layout. Each layout provides a systematic approach to production, with each serving a different type of product assembly. Consider your business needs before you choose the best manufacturing layout for your company.

What is Process Layout?

The process layout, also called the functional layout, is designed to keep everything organized in a manner so that everything has its place. Think about an auto mechanic's shop. New tires are stored in one section, whereas wrenches and other tools are stored in another section. The cans of oil are stored together, as are other groupings of supplies or power tools. Although this is an organized layout in which everyone always knows where all supplies and tools are

located, it isn't the most efficient for production lines, where the same job is performed every single time. The process layout is effective when each job is a custom situation. The mechanic's shop illustrates this well. One customer may come in needing only an oil change, but another may come in needing the entire transmission overhauled.

What is Product Layout?

The product layout is the opposite of the process layout. Rather than have a specific section for each group of tools and supplies, the product layout is an assembly line. The required tools and supplies are located at each section of the assembly line, based on where the product is in production. This is common in auto manufacturing where the car being made is moved down the line and stops at stations where different things are assembled. One section might be where doors are attached, whereas another section inserts the engine. This is an efficient system when the same product is being made without variation. Workers don't need to search or collect tools or supplies to perform their job. Giving workers one job to perform repeatedly reduces potential mistakes in the product assembly.

How Do You Choose a Layout?

The manufacturing layout will depend on business leaders determining the best process. Even though the functional layout requires more professional skill, automation can counter unskilled workers in the product layout. Because the process layout requires one worker or a small team to complete the entire task, the workflow is generally not as fast nor as smooth as it is with the product layout. However, the quality of the final product in a process layout is usually better than with the product layout. As you can see, there are advantages and

disadvantages to both systems. Evaluate your production space, your workforce and your ability to automate, before deciding on which layout will be the best solution for your business

12 Differences between Product Layout and Process Layout

Distinction between Product and Process Layout

The differences between a product layout and process layout can be studied as follows.

1. Nature of Product

Process or functional layout is more suitable for non-standardized products. But product or line layout is suitable for standardized product.

2. Preliminary Investment

Higher initial amount for investment in machines and equipment is required in product or line type of layout whereas in process layout, comparatively, lower initial investment is sufficient.

3. Volume of Production

Process layout is used for a large number of products where similar machines and equipment are used for the manufacture of each product, so the volume per product is low. But product or line layout is preferred where production of each product is done on a large scale basis.

4. Flexibility

Process layout is flexible because necessary alteration or change in sequence of operations can easily be made as and when required without upsetting the

existing layout plan. Whereas such changes in product design are quite impossible in machines and operations. Under product layout, if product design is changed, the layout becomes quite obsolete.

5. Effect of Breakdown

In product layout, in the event of any breakdown, the whole production plan is disturbed, whereas in process layout, a breakdown in machines will affect only the operations of that particular department. Other departments will remain unaffected in the short run.

6. Floor Space

Product layout requires less space for the arrangement of machines and equipment. But process layout requires comparatively more space for carrying out the production.

7. Manufacturing Time

Manufacturing time is less in product layout because the raw materials are fed into the machines at one end, the finished product comes out at another end. On the other hand, process layout takes comparatively more time because materials are moved from one machine or department to another by hand.

8. Material Handling Equipment and Costs

Since machines and equipment are arranged in sequence of operations under product layout, mechanical handling equipment like conveyor belts, etc., can be easily adopted. Mechanical handling equipment cannot be used under process layout because of frequent backward and upward movement of materials. So, handling costs in these two layouts vary considerably.

9. Utilization of Equipment and workers

Under process layout, the equipment is in flexible condition and can be used on various parts or products. Thus, utilization of equipment and machines is fully effective. But under product layout, the equipment and workers cannot be utilized in their full capacity because machines and workers are specialized for specific parts.

10. Supervision

The supervision is easy in product layout but as it requires specific type of supervision, the cost of supervision increases. In contrast, process layout needs frequent and continuous supervision, but due to functional specialization, the cost of supervision is less.

11. Control and Coordination

Production control is very simple in product layout so it necessitates less efforts for coordination. Under process or functional layout, production control is rather difficult because a part has to be routed through a number of departments located at different places. Therefore, much effort is needed to coordinate the functions of various departments.

12. Demand and Supply Layout

Under product layout, proper coordination between demand and supply is easy as they are made to stock. On the other hand, in process layout coordinating demand and supply is slightly difficult as these are made to order.

It is now quite clear from the above discussion that both the systems have their own merits and demerits. Advantages of one type of layout are the

disadvantages of other type. Thus, with a view to securing the advantage of both the systems a combined layout may be designed

Project specifications

The project specifications are usually the adaptation of the agreed quality standards for the project between the project owner and the contractor. In Europe, project specifications are usually adapted from the European Commission's Manual of Standard Building Specifications meaning construction or building projects must comply with applicable legislation and standards that apply according to where they are being built. Legislations are categorised and inspected according to the following building stages:

- Urban development legislation (planning permission and environmental licences)
- Architectural legislation (architectural design, structural calculations for the building shell)
- Legislation governing technical installations (dimensions, energy consumption)
- Legislation on health and safety at work
- Environmental legislation

There are also community legislations that include specific provisions concerning buildings, health and safety at work and environmental protection.

For standards, the Belgian standards (NBN) are recognised as the profession and trade standards. There are also various national standards per country. The European standards, on the other hand, emerge from the European Committee

on Iron and Steel Standards (ECISS), the European Committee for Standardisation (CEN) and the European Committee for Electrotechnical Standardisation (CENELEC). Global standards are based on the International Standardisation Organisation (ISO), the International Electro technical Commission (IEC), and the International Committee on the Conformity of Electrical Equipment (CEE-El).

Inspections and testing

Some project elements are traditionally tested by third-party organisations; examples of these are concrete strength, soil compaction, etc. Inspections alongside tests for these are usually conducted during the execution of the work wherein the product quality is ascertained and reported immediately alongside the progress following the inspections. Other than the contractor or the project manager, quality of certain project elements are inspected and determined by the architect or third party consultants during scheduled site visits. For those on-site products that do not pass the initial inspection and quality tests, the architect or the project manager will create a punch list of items that need to be corrected and redone in order to meet the set project specifications and quality standards. More on quality control and assurance inspections and the related building controls in our article on why construction inspections are important.

Quality control and quality assurance

Your construction project quality is managed by your quality management program that involves a quality control (QC) program and a quality assurance (QA) process. Quality control is managing and making sure that the requirements of the project quality are met according to specifications while quality assurance is defining the process and steps needed to be taken to ensure

that those quality requirements are met. Having rigorous inspection processes in your QC/QA management program are critical to deliver your project successfully. Additionally, your rigid QC/QA inspection system provides a useful guideline for managing the quality of work of your subcontractors. For inspections concerning health and safety, proceed to our article discussing construction inspections for compliance to health and safety standards.

The role of inspections in your quality management program

Ideally, to have an effective quality management program, the project owner and contractor should draft an agreed quality management program that includes a defined quality management process, a trained project manager of supervisor on the process, and a clear control system. A good management program should also incorporate work ownership and accountability with performance and results reviews.

Quality control inspections

Your quality control team should ensure that your construction products and services comply with the project requirements as taken from all the applicable standards and legislations we have mentioned above. Your quality control inspections are carried out for technical specifications and usually includes the execution, completion, products and materials of your:

- Concrete procedures
- Masonry
- Metals
- Wood plastic composite
- Thermal and moisture protection

- Openings
- Finishes
- Fire suppression
- HVAC
- Electrical
- Communications
- Electronic safety
- Exterior improvements
- Utilities

For a full list of the types of quality control inspections, you can refer to the Manual of Standard Building Specifications. With your QC inspections, inspection schedules should be set, as well as pre-cover-up and pre-closure inspections. These inspections should all be accompanied with proper documentation including written reports and photo and document attachments.

Quality assurance inspections

Your quality assurance team should ensure that your quality control program is running smoothly and that your quality assurance processes are carried out carefully. Your QA inspections play a huge role in:

- Establishing work practices that result to meeting quality standards
- Examining ongoing and completed works and their quality to determine if they meet project specifications
- Ensuring that the materials used comply with project quality standards
- Assuring that completed work is protected from damage or harm
- Issuing reports related to both acceptable and substandard works
- Tracking corrective works, reworks and issuing project status updates until completed satisfactorily

- Examining quality control processes and methods used to work out if the project manager is controlling on-site activities properly
- Reviewing processes, procedures, and practices and identifying possible areas for changes in order to improve the resulting work's quality
- Suggesting or requesting changes to the project team and management
- Reviewing quality control documentation to secure the effectiveness of the systems in place

Your QA inspections are usually guided by systemic actions and plans based on applicable external quality management system standards like the ISO 9000 family of standards.

Essentially, standardised inspections account for a good quality management program and assure quality for at least four good reasons:

- Competent inspection protect the industry from criticism and loss of public confidence that would result from inferior work.
- Good inspection protects the contractor's reputation from that damage that would result from unintentional failure of trusted employees to perform properly.

- Competent inspection protects the contractor from being placed at the competitive disadvantage that would result if other contractors were allowed to do substandard work.
- Good inspection protects a contractor who follows others in stage construction or as a subcontractor.

Standardised quality inspections are your gateway to a robust quality management system and overall quality project delivery. Having a construction software that assists you with your on-site quality inspections gives you the power to conduct top-notch yet easy inspections that eventually result to quality

project delivery, increased productivity, and an overall successful construction project

TOTAL QA I QC PROGRAM

What is a QA QC program?

QA/QC is the combination of **quality assurance**, the process or set of processes used to measure and assure the quality of a product, and **quality control**, the process of ensuring products and services meet consumer expectations

What is included in a quality control plan?

A **quality control plan** is the document that lists all the **quality**-related checkpoints to be passed during/after a production run. Depending on the situation, it can include**process**, product, or legal checkpoints. Getting this document approved is an essential step before production is allowed to start.

What is the different between QA and QC?

QA is a set of activities for ensuring quality **in the** processes by which products are developed. **QC** is a set of activities for ensuring quality in products. The activities focus on identifying defects **in the** actual products produced. **QA** aims to prevent defects**with a** focus on the process used to make the product

What are the methods of quality control?

Methods or Tools of Quality Control:

- Inspection: Inspection, in fact, is the common method used for quality control purposes not only in production but also in services. ...

- Statistical Quality Control: It is an advanced method or technique used to control the quality of a product.

What do you mean by 7 QC tools?

The **7 QC Tools are** simple statistical **tools** used for problem solving. ... For solving quality problems **seven QC tools** used **are** Pareto Diagram, Cause & Effect Diagram ,Histogram, Control Charts , Scatter Diagrams, Graphs and Check Sheets

QUALITY ASSURANCE & QUALITY CONTROL

Quality Glossary Definition: Quality assurance/quality control (QA/QC)

Quality assurance (QA) and quality control (QC) are two terms that are often used interchangeably. Although similar, there are distinct differences between the two concepts. This page will explain the differences between quality control and quality management, and provide definitions and examples of each.

- Differences between QA and QC
- Industry perspectives on QA and QC
- History of QA and QC
- QA and QC resources

DIFFERENCES BETWEEN QA AND QC

Quality assurance and quality control are two aspects of quality management. While some quality assurance and quality control activities are interrelated, the two are defined differently. Typically, QA activities and responsibilities cover virtually all of the quality system in one fashion or another, while QC is a subset of the QA activities. Also, elements in the quality system might not be specifically covered by QA/QC activities and responsibilities but may involve

QA and QC. Below are ISO 9000 definitions from ISO 9000:2015: Quality management systems - Fundamentals and Vocabulary.

Purchase ISO 9000:2015

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See training courses for these crucial functions:

Quality control training
Quality assurance training

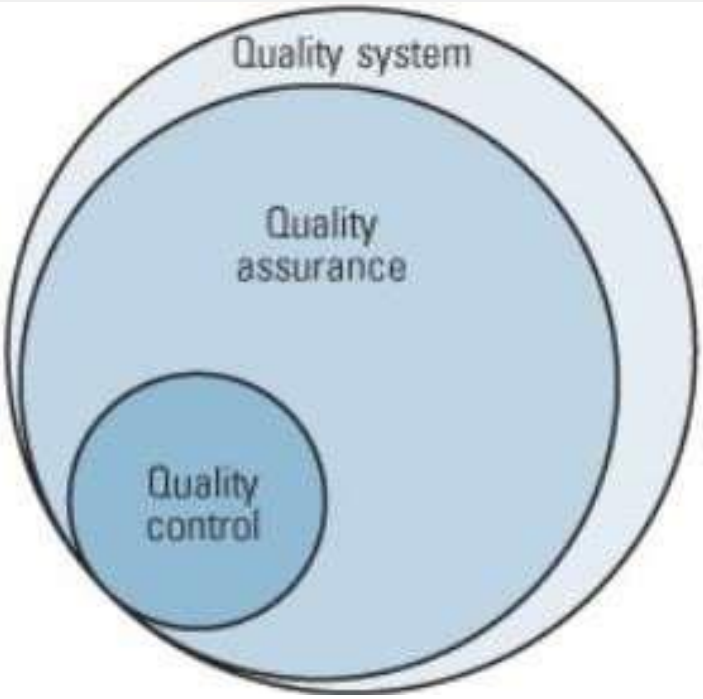

FIG.1 QUALITY SYSTEM, QUALITY ASSURANCE, AND QUALITY CONTROL RELATIONSHIPS

Quality Assurance

Quality assurance can be defined as "part of quality management focused on providing confidence that quality requirements will be fulfilled." The

confidence provided by quality assurance is twofold. Internally to management and externally to customers, government agencies, regulators, certifiers, and third parties. An alternate definition is "all the planned and systematic activities implemented within the quality system that can be demonstrated to provide confidence that a product or service will fulfil requirements for quality."

Quality Control

Quality control can be defined as "part of quality management focused on fulfilling quality requirements." While quality assurance relates to how a process is performed or how a product is made, quality control is more the inspection aspect of quality management. An alternate definition is "the operational techniques and activities used to fulfil requirements for quality."

INDUSTRY PERSPECTIVES ON QA AND QC

For some service organizations, the concept of quality control may be foreign because there is no tangible product to inspect and control. The quality assurance function in a service organization may not include quality control of the service but may include quality control of any products involved in providing the service. A service may include products that are documents (such as a report, contract, or design) or tangible products (such as a rental car or units of blood). It may be necessary to control product quality in a service organization to ensure that the service meets customer requirements.

QA, QC, and Inspection

Inspection is the process of measuring, examining, and testing to gauge one or more characteristics of a product or service and the comparison of these with specified requirements to determine conformity. Products, processes, and various other results can be inspected to make sure that the object coming off a

production line, or the service being provided, is correct and meets specifications.

Quality Assurance and Audit Functions

Auditing is part of the quality assurance function. It is important to ensure quality because it is used to compare actual conditions with requirements and to report those results to management. In The Quality Audit: A Management Evaluation Tool (McGraw-Hill, 1988), Charles Mill wrote that auditing and inspection are not interchangeable: "The auditor may use inspection techniques as an evaluation tool, but the audit should not be involved in carrying out any verification activities leading to the actual acceptance or rejection of a product or service. An audit should be involved with the evaluation of the process and controls covering the production and verification activities." Formal management systems have evolved to direct and control organizations. There are quality management systems (QMSs) as well as environmental or other management systems, and each of these systems may be audited.

HISTORY OF QA AND QC

Quality has been defined as fitness for use, conformance to requirements, and the pursuit of excellence. Even though the concept of quality has existed from early times, the study and definition of quality have been given prominence only in the last century.

1920s: Quality Control

Following the Industrial Revolution and the rise of mass production, it became important to better define and control the quality of products. Originally, the goal of quality was to ensure that engineering requirements were met in final products. Later, as manufacturing processes became more complex, quality

developed into a discipline for controlling process variation as a means of producing quality products.

1950s: Quality Assurance and Auditing

The quality profession expanded to include the quality assurance and quality audit functions. The drivers of independent verification of quality were primarily industries in which public health and safety were paramount.

Quality assurance

Quality assurance (**QA**) is a way of preventing mistakes and defects in manufactured products and avoiding problems when delivering products or services to customers; which ISO 9000 defines as "part of quality management focused on providing confidence that quality requirements will be fulfilled". This defect prevention in quality assurance differs subtly from defect detection and rejection in quality control and has been referred to as a shift left since it focuses on quality earlier in the process (i.e., to the left of a linear process diagram reading left to right). The terms "quality assurance" and "quality control" are often used interchangeably to refer to ways of ensuring the quality of a service or product. For instance, the term "assurance" is often used as follows: Implementation of inspection and structured testing as a measure of quality assurance in a television set software project at Philips Semiconductors is described. The term "control", however, is used to describe the fifth phase of the Define, Measure, Analyze, Improve, Control (DMAIC) model. DMAIC is a data-driven quality strategy used to improve processes.

Quality assurance comprises administrative and procedural activities implemented in a quality system so that requirements and goals for a product, service or activity will be fulfilled.[3] It is the systematic measurement, comparison with a standard, monitoring of processes and an associated

feedback loop that confers error prevention. This can be contrasted with quality control, which is focused on process output.

Quality assurance includes two principles: "Fit for purpose" (the product should be suitable for the intended purpose); and "right first time" (mistakes should be eliminated). QA includes management of the quality of raw materials, assemblies, products and components, services related to production, and management, production and inspection processes. The two principles also manifest before the background of developing (engineering) a novel technical product: The task of engineering is to make it work once, while the task of quality assurance is to make it work all the time. Historically, defining what suitable product or service quality means has been a more difficult process, determined in many ways, from the subjective user-based approach that contains "the different weights that individuals normally attach to quality characteristics," to the value-based approach which finds consumers linking quality to price and making overall conclusions of quality based on such a relationship

Initial efforts to control the quality of production[edit]

During the Middle Ages, guilds adopted responsibility for the quality of goods and services offered by their members, setting and maintaining certain standards for guild membership. Royal governments purchasing material were interested in quality control as customers. For this reason, King John of England appointed William de Wrotham to report about the construction and repair of ships. Centuries later, Samuel Pepys, Secretary to the British Admiralty, appointed multiple such overseers to standardize sea rations and naval training.

Prior to the extensive division of labour and mechanization resulting from the Industrial Revolution, it was possible for workers to control the quality of their own products. The Industrial Revolution led to a system in which large

groups of people performing a specialized type of work were grouped together under the supervision of a foreman who was appointed to control the quality of work manufactured.

Wartime production

During the time of the First World War, manufacturing processes typically became more complex, with larger numbers of workers being supervised. This period saw the widespread introduction of mass production and piece work, which created problems as workmen could now earn more money by the production of extra products, which in turn occasionally led to poor quality workmanship being passed on to the assembly lines. Pioneers such as Frederick Winslow Taylor and Henry Ford recognized the limitations of the methods being used in mass production at the time and the subsequent varying quality of output. Taylor, utilizing the concept of scientific management, helped separate production tasks into many simple steps (the assembly line) and limited quality control to a few specific individuals, limiting complexity. Ford emphasized standardization of design and component standards to ensure a standard product was produced, while quality was the responsibility of machine inspectors, "placed in each department to cover all operations ... at frequent intervals, so that no faulty operation shall proceed for any great length of time."

Out of this also came statistical process control (SPC), which was pioneered by Walter A. Stewart at Bell Laboratories in the early 1920s. Shewhart developed the control chart in 1924 and the concept of a state of statistical control. Statistical control is equivalent to the concept of exchangeability[15][16] developed by logician William Ernest Johnson, also in 1924, in his book Logic, Part III: The Logical Foundations of Science.[17] Along with a team at AT&T that included Harold Dodge and Harry Romig, he worked

to put sampling inspection on a rational statistical basis as well. Shewhart consulted with Colonel Leslie E. Simon in the application of control charts to munitions manufacture at the Army's Picatinny Arsenal in 1934.[18] That successful application helped convince Army Ordnance to engage AT&T's George Edwards to consult on the use of statistical quality control among its divisions and contractors at the outbreak of World War II.[19]

Postwar

After World War II, many countries' manufacturing capabilities that had been destroyed during the war were rebuilt. General Douglas MacArthur oversaw the rebuilding of Japan. He involved two key people in the development of modern quality concepts: W. Edwards Deming and Joseph Juran. They and others promoted the collaborative concepts of quality to Japanese business and technical groups, and these groups used these concepts in the redevelopment of the Japanese economy. Although there were many people trying to lead United States industries toward a more comprehensive approach to quality, the US continued to apply the Quality Control (QC) concepts of inspection and sampling to remove defective products from production lines, essentially unaware of or ignoring advances in QA for decades.

Approaches

Failure testing

It is valuable to failure test or stress test a complete consumer product. In mechanical terms this is the operation of a product until it fails, often under stresses such as increasing vibration, temperature, and humidity. This may expose many unanticipated weaknesses in the product, and the data is used to drive engineering and manufacturing process improvements. Often quite simple changes can dramatically improve product service, such as changing to mold-

resistant paint or adding lock-washer placement to the training for new assembly personnel.

Statistical control

Statistical control is based on analyses of objective and subjective data. Many organizations use statistical process control as a tool in any quality improvement effort to track quality data. Any product can be statistically charted as long as they have a common cause variance or special cause variance to track. Walter Shewart of Bell Telephone Laboratories recognized that when a product is made, data can be taken from scrutinized areas of a sample lot of the part and statistical variances are then analyzed and charted. Control can then be implemented on the part in the form of rework or scrap, or control can be implemented on the process that made the part, ideally eliminating the defect before more parts can be made like it.

Total quality management[edit]

Main article: Total quality management

The quality of products is dependent upon that of the participating constituents, some of which are sustainable and effectively controlled while others are not. The process(es) which are managed with QA pertain to Total quality management.

If the specification does not reflect the true quality requirements, the product's quality cannot be guaranteed. For instance, the parameters for a pressure vessel should cover not only the material and dimensions but operating, environmental, safety, reliability and maintainability requirements.

Models and standards

ISO 17025 is an international standard that specifies the general requirements for the competence to carry out tests and or calibrations. There are 15 management requirements and 10 technical requirements. These requirements

outline what a laboratory must do to become accredited. Management system refers to the organization's structure for managing its processes or activities that transform inputs of resources into a product or service which meets the organization's objectives, such as satisfying the customer's quality requirements, complying with regulations, or meeting environmental objectives. WHO has developed several tools and offers training courses for quality assurance in public health laboratories. The Capability Maturity Model Integration (CMMI) model is widely used to implement Process and Product Quality Assurance (PPQA) in an organization. The CMMI maturity levels can be divided into 5 steps, which a company can achieve by performing specific activities within the organization.

Company quality

During the 1980s, the concept of "company quality" with the focus on management and people came to the fore in the U.S. It was considered that, if all departments approached quality with an open mind, success was possible if management led the quality improvement process. The company-wide quality approach places an emphasis on four aspects (enshrined in standards such as ISO 9001):

- Elements such as controls, job management, adequate processes, performance and integrity criteria, and identification of records
- Competence such as knowledge, skills, experiences, qualifications
- Soft elements, such as personnel integrity, confidence, organizational culture, motivation, team spirit and quality relationships
- Infrastructure (as it enhances or limits functionality)

The quality of the outputs is at risk if any of these aspects is deficient.

QA is not limited to manufacturing, and can be applied to any business or non-business activity, including: design, consulting, banking, insurance, computer software development, retailing, investment, transportation, education, and translation. It comprises a quality improvement process, which is generic in the sense that it can be applied to any of these activities and it establishes a behaviour pattern, which supports the achievement of quality.

This in turn is supported by quality management practices which can include a number of business systems and which are usually specific to the activities of the business unit concerned. In manufacturing and construction activities, these business practices can be equated to the models for quality assurance defined by the International Standards contained in the ISO 9000 series and the specified Specifications for quality systems. In the system of Company Quality, the work being carried out was shop floor inspection which did not reveal the major quality problems. This led to quality assurance or total quality control, which has come into being recently.

In practice

Medical industry

QA is very important in the medical field because it helps to identify the standards of medical equipments and services. Hospitals and laboratories make use of external agencies in order to ensure standards for equipment such as X-ray machines, Diagnostic Radiology and AERB. QA is particularly applicable throughout the development and introduction of new medicines and medical devices. The Research Quality Association (RQA) supports and promotes the quality of research in life sciences, through its members and regulatory bodies.

Aerospace industry

The term product assurance (PA) is often used instead of quality assurance and is, alongside project management and engineering, one of the three primary project functions. Quality assurance is seen as one part of product assurance. Due to the sometimes catastrophic consequences a single failure can have for human lives, the environment, a device, or a mission, product assurance plays a particularly important role here. It has organizational, budgetary and product developmental independence meaning that it reports to highest management only, has its own budget, and does not expend labour to help build a product. Product assurance stands on an equal footing with project management but embraces the customer's point of view.

Software development

Main article: Software testing

Software quality assurance refers to monitoring the software engineering processes and methods used to ensure quality. Various methods are employed for this, such as ensuring conformance to one or more standards, such as ISO 9000 or a model such as CMMI. In addition, enterprise quality management software is used to correct issues such as supply chain disaggregation and to ensure regulatory compliance; these are vital for medical device manufacturers.

Using contractors or consultants

Consultants and contractors are sometimes employed when introducing new quality practices and methods, particularly where the relevant skills and expertise and resources are not available within the organization. Consultants and contractors will often employ Quality Management Systems (QMS), auditing and procedural documentation writing CMMI, Six Sigma, Measurement Systems Analysis (MSA), Quality Function

Deployment (QFD), Failure Mode and Effects Analysis (FMEA), and Advance Product Quality Planning (APQP)

8 QUALITY ASSURANCE AND QUALITY CONTROL

8.1 INTRODUCTION

An important goal of IPCC *good practice guidance* is to support the development of national greenhouse gas inventories that can be readily assessed in terms of quality and completeness. It is *good practice* to implement quality assurance and quality control (QA/QC) procedures in the development of national greenhouse gas inventories to accomplish this goal.

This guidance establishes *good practice* consistent with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (*IPCC Guidelines*). The QA/QC *good practice guidance* outlined here reflects practicality, acceptability, cost-effectiveness, existing experience, and the potential for application on a world-wide basis. A QA/QC programme contributes to the objectives of *good practice guidance*, namely to improve transparency, consistency, comparability, completeness, and confidence in national inventories of emissions estimates.

The outcomes of the QA/QC process may result in a reassessment of inventory or source category uncertainty estimates. For example, if data quality is found to be lower than previously thought and this situation cannot be rectified in the timeframe of the current inventory, the uncertainty estimates ought to be re-evaluated.

The terms 'quality control' and 'quality assurance' are often used incorrectly. The definitions of QC and QA in Box 8.1 will be used for the purposes of *good practice guidance*.

BOX 8.1

DEFINITION OF QA/QC

Quality Control (QC) is a system of routine technical activities, to measure and control the quality of the inventory as it is being developed. The QC system is designed to:

(i) Provide routine and consistent checks to ensure data integrity, correctness, and

QA I QC PROGRAM AND COST IMPLICATION

In practice, the **QA/QC** system is only part of the inventory development process and inventory agencies do not have unlimited resources. **Quality control** requirements, improved accuracy and reduced uncertainty need to be balanced against requirements for timeliness and **cost** effectiveness.

What is a QC process?

Quality control (**QC**) is a procedure or set of **procedures** intended to ensure that a manufactured product or performed service adheres to a defined set of quality criteria or meets the requirements of the client or customer. **QC** is similar to, but not identical with, quality assurance (QA).

What is QA and QC in construction?

QA and QC in Construction. ... **Quality Assurance** (**QA**), refers to the implementation of proactive processes that aim to prevent defects. **Quality Control**(**QC**) simply refers to the process of inspecting the product to identify and correct defects.

What is the difference between quality assurance and quality control PDF?

Quality assurance and quality control processes are intended to make a product defect- free and ensure it conforms to requirements. The purpose of both processes is the same, however the approach is **different**. **Quality assurance** is a process based approach and **quality control** is a product based approach.

What is the role of QC?

Quality control (**QC**) is a process through which a business seeks to ensure that product quality is maintained or improved. ... A major aspect of **quality control** is the establishment of well-defined controls. These controls help standardize both production and reactions to quality issues

What is QC checklist?

A **quality control checklist** is basically a written guide for your products' contents, packaging, color, barcodes, appearance, possible defects, functions

and special requirements. It's also sometimes called an “inspection criteria sheet” or inspection**checklist**

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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF CIVIL ENGINEERING

UNIT III - QUALITY ASSURANCE AND QUALITY CONTROL - SCI 1614

Objectives – Regularity agent, owner, design, contract and construction-oriented objectives, methods -Techniques and needs of QA/QC -Different aspects of quality – Appraisals, Factors Influencing construction quality.

Project Brief

It is a document which outlines project requirements for the client and delivery departments, establishes a basis (functional, spatial, and technical criteria) for evaluating design solutions/alternatives, provides a reference document for design consultants, and provides a reference for post-occupancy evaluations.

Review Stages and Submission Requirements

The building design is divided into four stages, such that each stage culminates in a distinct product requiring reviews and approval. The four stages are:

- Schematic Alternatives
- Schematic Design
- Design Development
- Contract Drawings and Specification Documents

Stage 1 - Schematic Alternatives

In this stage, the consultant is given an opportunity to demonstrate practical and imaginative responses to the **Project Brief**. Alternatives for site, functional layout, building sections, and elevations are developed considering the objectives, assumptions and criteria in the Project Brief and the governing codes and regulations. The alternatives are reviewed and evaluated. The most cost-effective and technically appropriate alternative is selected to advance to schematic design.

Submission Requirements

The purpose of this submission is to review alternatives presented by the consultant exploring ways of achieving the owner's goals and objectives. Project cost, relative benefits, and project schedule, are reviewed for each alternative so the owner can make practical and informed decisions within the given budget restraints.

Documents required for this review: Drawings:

Freehand sketches are acceptable as long as they are to scale and the scale remains consistent.

- Site plan alternatives
- Floor plan alternatives
- Building section alternatives
- Elevation alternatives

Report/Written Information:

A formal report is not required. Report(s) on the following in a letter format is sufficient at this stage.

- Adequacy of site, program areas, and budget.
- Foundation/structural alternatives worth considering.
- Plumbing system alternatives worth considering.
- Heating system alternatives worth considering.
- Ventilation system alternatives worth considering.
- Power system alternatives (i.e. phase/loads) worth considering.
- Lighting system alternatives worth considering.
- Other electrical systems alternatives worth considering.

- A summary table or listing of applicable code requirements and proposed responses.
- Preliminary cost estimate information that will allow the owners to confirm the project budget

Class "D" Estimate

Additional project information, clarification or elaboration requested by the consultant should be provided. Finally, the consultant accepts the provisions of the Functional Program, Technical Requirements, site information and cost objectives as the basis of the design before commencing any design work.

Technical Status Evaluation

If the project brief calls for a **Technical Status Evaluation** the consultant should report on the following:

All building systems should be reviewed in terms of their current condition, performance and potential service life. Building systems include but are not limited to the following:

- Site (drainage and amenities)
- Foundation
- Structural systems
- Building envelope (roof, walls, floors) doors and windows (including hardware)
- Interior finishes
- Plumbing systems
- Heating systems

- Ventilation systems
- Electrical system
- Lighting
- Alarms

Fire protection systems

Recommendations to repair or replace the above building systems should be made. Any recommendations made should be accompanied by a life cycle cost analysis. If alternatives are presented, a cost benefit analysis should be included.

If Community and Government Services has completed the **Technical Status Evaluation** on the existing building then it must be reviewed, analyzed and included in the development and the evaluation of alternatives.

Evaluation of Alternatives

All alternatives presented must be evaluated. Recommendations must be presented. The alternative selected must be technically feasible. It must also meet the specified objectives and criteria described in the **Project Brief**. In this document the consultant must:

present an evaluation of the alternatives. The consultant must limit specific recommendations to those matters related to the technical aspects of the project.

use the objectives, assumptions and criteria provided in the **Project Brief** and good architectural and engineering practice to evaluate alternatives. Although the selection and evaluation of alternatives must be thorough, it is not intended that the consultant undertake detailed design to evaluate alternatives.

document, and quantify the advantages and disadvantages of alternatives.

Identify the apparent risks and potential problems with each alternative.

document and address community concerns.

ensure that proposed alternatives are technically feasible, practical, and economical. Serious problems or issues should not arise in the design development phase that would cause the alternative to be abandoned or to significantly alter the concept, design, cost, or cost effectiveness because of pertinent information were not collected.

prepare cost estimates for alternative concepts and systems. Prepare economic analysis of the alternatives.

Stage 2 - Schematic Design

Based on the agreed criteria and the preferred alternative established within Stage 1, the consultant prepares schematic design documents, consisting of drawings and other documents illustrating the general scope, scale and relationship of the project components. Designs produced will be conceptual in character, indicating the proposed plan form, site plan and appearance of the facility with relation to orientation, topography, adjacent land use and utilities, as well as general approach to structural, mechanical and electrical systems. Furthermore, the consultant outlines major mechanical, electrical, structural and architectural sub-systems to demonstrate that the preferred alternative can be implemented, that it represents the best solution to the requirements of the Project Brief, and that it complies with all governing codes and regulations.

Submission Requirements

The purpose of this review is to assess the suitability of the schematic alternative in

meeting the requirements of the **Project Brief**, community aspirations, and budget objectives. Architectural, Mechanical and Electrical systems will be outlined in greater detail to clearly reveal project design direction, cost implications and how the building systems are integrated.

Documents required for this review:

Drawings:

- Location and site plan
- Schematic floor plans
- Preliminary furniture layouts
- Schematic cross sections
- Typical envelope assembly (roof, walls, and floor)
- Building elevations
- Structural plans
- Plumbing, heating and ventilation plan(s),
- Electrical and lighting plan(s)

Report/Written Information:

Changes to any pre-design information prepared for the consultant and agreed to at the previous review are to be documented and incorporated into the Schematic Design. The Occupancy Classification under the National Building Code as approved by the Office of the Fire Marshal is to be stated. A summary table or listing of applicable code requirements and proposed responses. Description of any design "features" or important site conditions that may not be apparent from the drawings alone. The rationale behind any important design decisions that may assist in explaining choices, which may not appear to be appropriate. Summary of

floor areas compared to program areas.

Foundation/structural system description.

Identify areas where the design deviates from the **Good Building Practices Guideline**.

Mechanical and Electrical Information (and Drawings) required as part of Design Submissions:

Include a copy of preliminary design calculations for the heating load, ventilation rates, fuel oil storage, water tanks, sewage holding tanks, and expansion tanks.

Indicate approximate location of the exterior oil tank, sewage pump out connection(s), water fill connection(s), chimney(s), plumbing vent(s), intake(s) and exhaust hood(s).

Provide separate floor plans for each floor, including crawlspace and mezzanine.

Provide preliminary layouts of mechanical room(s) indicating all equipment to correct scale.

Provide information and description of major equipment and components to be used in the building.

Include location of main electrical service equipment and existing or proposed utility power locations (site plan).

Provide separate electrical drawings for each floor, including proposed lighting and power layout.

Description of existing and/or proposed electrical systems and sub-systems:

Distribution - Generator - Lighting

Music

Voice & Data - Public Address Systems
- Security - Engine Generator - Fire
- O & M Considerations - Power -
Television
- Specialized Electrical- Exit & Emergency Systems

- **Class "C" Estimate**

Stage 3 - Design Development

In the design development phase, the consultant prepares sketch drawings based upon the selected schematic design alternative, in order to determine more precise aspects of planning, appearance and construction. These documents illustrate and define the design concept in terms of site, plan form, character, materials, and the systems for structural, mechanical and electrical.

The drawings and preliminary specifications produced during this phase shall be based on the selected and approved schematic design alternative and typically will be of sufficient detail to allow for client and community reviews. Site plans, floor plans, elevations, representative sections, drawings outlining the mechanical and electrical systems, as well as a description of all the critical components of the building technology, materials, and equipment are presented. These documents will not, however, be sufficient to enable construction nor tendering of the project. Also, the interior and exterior color schemes are addressed along with the use of natural and artificial lighting and acoustical treatments.

Submission Requirements

The purpose of this review is to finalize design related issues, technical criteria, technical performance objectives, and budget forecasts so that the contract

documents can be prepared. The Design Development submission must fully convey the design intent. Further advances to the project documentation should not proceed until the design. development has received approval. Documents required for this

review: Drawings:

- Site plan
- Floor Plan
- Foundation plan/floor framing plan
- Roof framing plan
- Building cross sections
- Roof, wall, floor sections
- Color Boards (at least 2 alternatives)
- Mechanical site plan
- Plumbing/heating/ventilation plan(s)
- Electrical site plan
- Lighting plan Power/other electrical system plan(s)
- Preliminary door and window schedules
- Preliminary hardware schedules
- Preliminary sign schedule
- Interior elevation details
- Furniture layout
- Preliminary finish schedule
- Exterior elevations
- Mechanical/electrical room plan detail
- Piping and/or system schematics
- Electrical details

- Main distribution single line diagram
- Fixture mounting details(s) (if usual)

Report/Written Information:

Record of any revisions or clarifications to the project requirements made since the previous review.

The Occupancy Classification under the National Building Code as approved by the Office of the Fire Marshal (reaffirmed or revised from previous submission).

A summary table or listing of applicable code requirements and proposed responses (reaffirmed or revised based on previous submission).

Description of any design "features" or important site conditions (reaffirmed or revised based on previous submission).

The rationale behind any important design decisions (reaffirmed or revised base previous submission).

Summary of floor areas compared to program areas.

Structural assumptions used to calculate both floor and roof loading.

Mechanical and Electrical Information (and drawings) required as part of Design Submissions:

Indicate all plumbing fixtures, floor drains, plumbing and waste piping on floor plans.

Provide structural support details for all domestic/fire water and sewage storage

tanks, if applicable.

Provide fire protection system detail, including level of coverage, type and zoning. Indicate hand held fire extinguisher locations.

Provide heating distribution system and ancillary component layouts including: complete boiler room piping schematics, heating coil piping takeoff locations, and heating coil piping and pumping configuration details.

Provide ventilation system layouts including: system schematics, sequence of operation, single line main, and branch duct runs, terminal devices, fire dampers, and accessories.

Provide equipment schedules on a dedicated mechanical drawing to include: all mechanical components such as boilers, pumps, coils, heaters, fans, tanks, control valves, diffusers, grilles, terminal heat transfer units, and other accessories. The schedule is to include information on equipment identification, model, size, flow, pressure, voltage, CV, capacity, and other remarks.

Provide control system schematics including system types, layouts, and sequence operation. Include a description of the mechanical alarm system.

Provide legible Product Data sheets on all major mechanical components.

Provide in the specification, detailed information of products intended for use including manufacturer, model numbers, type, style, phase, voltage, capacity for equipment components specified in the project.

Provide legible Product Data sheets on all major electrical components, and fixtures (Catalogue cuts are acceptable with visible indication of proposed product). Provide Main Distribution single line diagram

Provide drawings of power, lighting and other electrical system locations with

proposed device zoning, circuit number, panel designation, for:

Power Lighting

Security Other

Provide complete electrical room details with equipment layout.

Provide fixture-mounting details, if unusual.

Switching

- Fire

Alarm

Provide service and feeder calculations, c/w lighting and power demands.

Demand factors for existing or proposed building.

Panel & Motor schedules.

An outline specification.

Product information for all major equipment must be provided listing specific equipment manufacturers (catalogue cuts are acceptable).

Class "B" Estimate

Stage 4 - Contract Drawings and Specification Documents

In this phase, the consultant prepares construction documents consisting primarily of working drawings and specifications. Working drawings are graphic representations that include plans elevations, sections, construction details and site plans. These drawings also illustrate coordination of structural, mechanical, electrical and utility plans and details where applicable. A major part of working drawings consists of detail drawings, which are large scale representations of certain parts of the project, clearly showing arrangements, assemblies, profiles and dimensions: they may be furnished with the working drawings or when

construction is in progress. Specifications are written descriptions of all elements that are best described rather than delineated, including requirements related to the manufacture, methods of installation, design, testing, commission performance criteria and workmanship of materials and equipment.

Submission Requirements - 50%

The purpose of this review is to ensure that the design intent will be adequately communication to potential bidders or those responsible for the construction of the facility. The documents, reviewed for completeness and coordination.

Documents required for this review: Drawings:

A partial completed set of drawings and details is required which contains enough information to allow a full understanding by the review of the intended choices of materials, assembly, design features, spatial requirements of equipment, fittings and fixtures. The emphasis should be on providing basic information on almost all aspects of the project rather than issuing fully completed segments separated by near blank information gaps. Approximately 2/3 of the total effort devoted to construction documentation would normally have to be expended to convey this amount of information.

Report/Written Information:

Product selections and system descriptions should be complete.

Submission Requirements - 100%

The purpose of this review is to ensure that all systems, products and assemblies are adequately communicated to potential bidders or those responsible for the construction of the facility. The documents are reviewed

for completeness and coordination.

Class "A" Estimate must be submitted at this review.

Building Types

Reviews are intended to assist in advancing technically appropriate, functionally sufficient, economic solutions to building projects. Facility Planners and Project Officer shall use **Table 1** to identify review stages and submission requirements when preparing requests for proposals for Architectural/Engineering (A/E) services.

TABLE 1 DESIGN REVIEW STAGES

Building Type	Schematic Alternatives	Schematic Design	Design Development	50% Contract Document	100% Contract Document
Schools – New & Renovated	X	X	X	X	X
Learning Centers	X	X	X	X	X
Arenas	X	X	X	X	X
Community Offices	X	X	X	X	X
Libraries	X	X	X	X	X
Air Terminal Buildings - New & Renovated	X	X	X	X	X
New & Renovated Health Centers	X	X	X	X	X
Fire Halls			X		X
Maintenance Garages			X		X
Parking Garages			X		X

Note: For repeat designs, certain reviews can be eliminated

Note: All reviews are coordinated through the Project Officer (or Project Manager).

Design Review Team

TABLE 4.1 - DESIGN REVIEW TEAM

Design Phase	Project Officer	Technical Officer	Facility Planner	Client	User	Fire Marshal	Safety Services
Schematic lternatives	X	X	X	X	X		
Schematic Design	X	X	X	X	X		
Design Development	X	X	X	X	X		
50% Contract Documents	X	X	X			X	
100% Contract Documents	X	X	X			X	X

The Project Officer is responsible for effective team building to ensure the project is delivered in compliance with the **Project Brief**, applicable government codes, regulations and standards. Maintaining contact with the client, user, consultants, contractors, suppliers, Facility Planners, Technical

Officers, and regulatory agencies, the Project Officer guides the delivery of the

project in the community. By requesting project reviews, the Project Officer calls upon the resources of Facility Planners and Technical Officers who can bring the perspective and experience of other regions and similar projects to the table. A list of personnel and the stage at which they will participate in the Design Review process is shown in **Table** . Contact information is provided in **Table** .

Recommendations:

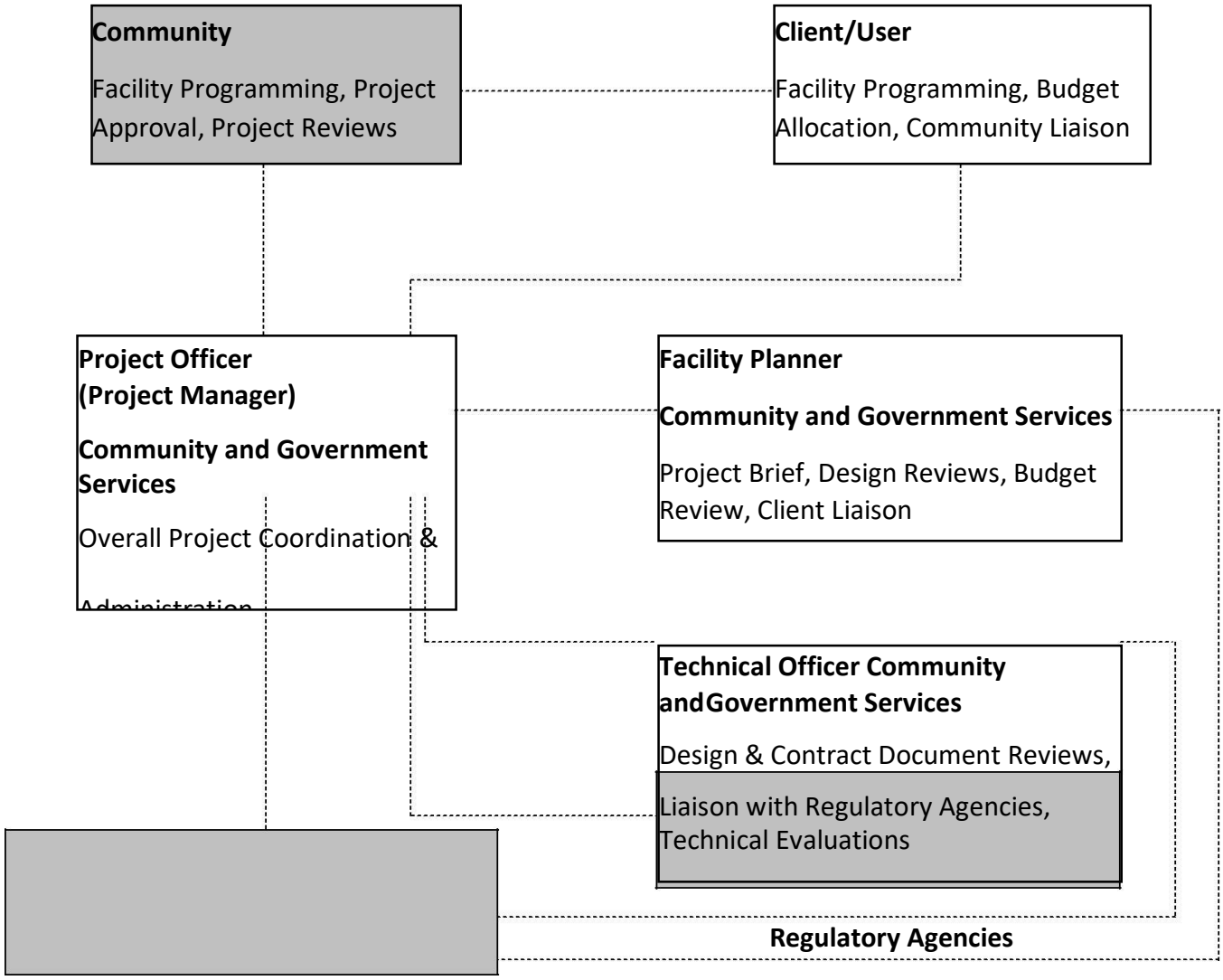
In order to allow time for proper document reviews, the Project Officer should advise and coordinate the scheduling of documents with the Design Review Team well in advance of meeting dates.

The Facility Planner's role on projects is extended to the end of the design review process. The Facility Planner is the primary contact in Headquarters for all matter related to the **Project Brief**. Civil, Structural, Architectural, Mechanical and Electrical reviews may be passed directly to the Technical Officers.

All major projects have a design start-up meeting. Those attending include the Project Officer, Client, Consultant(s) and Facility Planner. Items for discussion include design requirements, interpretation of the **Project Brief**, budget, roles and responsibilities, and lines of communication. Unless otherwise requested, all communication to the various parties is through the Project Officer.

Meetings with consultants, communities, and/or the client are to be coordinated by the Project Officer. If the Project Officer or regional backup is unavailable, the Facility Planner could coordinate the meeting on behalf of the Project Officer if requested by the Regional Project Manager.

TABLE 3 LINES OF COMMUNICATION – DESIGN PHASE



The relationships between key stakeholders are illustrated in the above chart. Once again, design reviews; community consultation, regulatory approvals and client participation and input are coordinated by the Project Officer (or Project Manager).

Quality assurance: Importance of systems and standard operating procedures

High levels of quality are essential to achieve Company business objectives. Quality, a source of competitive advantage, should remain a hallmark of Company products and services. High quality is not an added value; it is an essential basic requirement. Quality does not only relate solely to the end products and services a Company provides but also relates to the way the Company employees do their job and the work processes they follow to produce products or services. The work processes should be as efficient as possible and continually improving. Company employees constitute the most important resource for improving quality. Each employee in all organizational units is responsible for ensuring that their work processes are efficient and continually improving.

Top management should provide the training and an appropriate motivating environment to foster teamwork both within and across organizational units for employees to improve processes. Ultimately, everyone in a Company is responsible for the quality of its products and services. A Company in the role of a sponsor of clinical trials can best achieve its business objectives by establishing and managing robust quality systems with their integral quality documents including standard operating procedures (SOPs).

QUALITY SYSTEMS

A quality system is defined as the organizational structure, responsibilities, processes, procedures and resources for implementing quality management. Quality management includes those aspects of the overall management function that determine and implement the Company quality policy and quality objectives. Both quality control and quality assurance are parts of

quality management.

The 13th principle in the International Conference on Harmonization Good Clinical Practice (ICH GCP) guideline clearly states that systems and procedures that assure the quality of every aspect of the (clinical) trial should be implemented. The sponsor is responsible for implementing and maintaining quality assurance and quality control systems with written SOPs to ensure that trials are conducted and data are generated, documented (recorded) and reported in compliance with the protocol, Good Clinical Practice (GCP) and the applicable regulatory requirements. Although a sponsor may transfer any or all of its trial-related duties and functions to a contract research organization (CRO), the ultimate responsibility for the quality and integrity of the trial data always resides with the sponsor. However, the CRO is also required in its own right to always implement quality assurance and quality control. Both quality control and quality assurance systems must be commensurate with the Company business objectives and business model. The two together constitute the key quality systems. Top management commitment and active involvement in the establishment, management and monitoring of quality systems is critical and is achieved by

- Defining and documenting a quality policy and quality objectives and ensuring that both the policy and objectives are understood and implemented by all employees at all levels;
- Ensuring that appropriate processes are implemented to fully satisfy customer needs and expectations and Company objectives;
- Defining and documenting the responsibility, authority and interrelation of key personnel managing the quality systems;

- Providing adequate resources for implementing and maintaining the quality systems;
- Conducting scheduled management reviews of the quality systems to assess their continued suitability, adequacy, effectiveness and efficiency; and
- Deciding on actions for continual quality improvement.

Quality control is focused on fulfilling quality requirements, and as related to clinical trials, it encompasses the operational techniques and activities undertaken within the quality assurance system to verify that the requirements for quality of the trial-related activities have been fulfilled. Quality assurance, on the other hand, is focused on providing confidence that quality requirements are fulfilled. As related to clinical trials, it includes all those planned and systemic actions that are established to ensure that the trial is performed and the data are generated, documented (recorded), and reported in compliance with GCP and the applicable regulatory requirements.

Quality control is generally the responsibility of the operational units and quality is infused into the outputs and verified as they are being generated. Therefore, quality control is an integral part of the daily activities occurring within each operational unit. Quality assurance is the responsibility of the quality assurance department. The mission of a quality assurance department is to provide an effective and efficient quality assurance system and counsel for the operational units. The quality assurance department must be manned by an adequate number of dedicated and adequately qualified and trained personnel with well-developed interpersonal skills. The well- developed interpersonal skills will provide the quality assurance personnel with

persuasive, diplomatic, tactful and resilient qualities generally required of them. The quality assurance department must operate independently from the operational units and it must regularly perform quality review activities (self-inspection audits/internal audits) to ensure compliance within operational units with Company quality standards, good working practices [GxPs: current Good Manufacturing Practice (cGMP), Good Laboratory Practice (GLP), GCP, etc.], and local, national, regional and international legal, ethical and regulatory requirements.

The quality assurance department under the leadership of a Quality Assurance Manager will ensure the following:

- Appropriate global and affiliate-specific quality documents (Level 1: Company policies including quality policy and quality management plan; Level 2: SOPs; Level 3: working instructions; Level 4: conventions, guidelines, forms, templates, logs, tabs, and labels) are determined, developed and implemented.
- Personnel involved in clinical research and development are, and remain, properly qualified and trained for job roles for which they are made responsible. The training will include new staff induction, ongoing quality awareness training including training in applicable SOPs and other quality documents, training for changing roles within and between functional units, and training resulting from an analysis of needs including the results of audits and regulatory inspections, top management reviews and employee appraisals. Further education and additional training needs should be constantly assessed by the Company.
- All clinical research and development activities are conducted according to Company quality standards, current GxPs, and all

applicable local, national, regional and international legal, ethical and regulatory requirements as defined in the quality documents, to meet with Company quality objectives and customer requirements.

- A system is put in place to track all global and affiliate-specific quality documents and to maintain an up-to-date overall inventory of all historical and effective quality documents.
- Personnel will have written job descriptions which will clearly define their roles and responsibilities, and the processes and SOPs which they have to follow.
- A system is put in place to initiate and maintain a personal file on each employee, containing his/her current curriculum vitae, job description, education and training records and personal and professional development plan.
- An auditing function, independent of the operational units and the quality control system, is created to plan, conduct, and report internal and external audits and to support and monitor their close-out via appropriate corrective actions and preventive actions (CAPA) plan.[3,4] The effectiveness of the corrective and the preventive actions must be assessed.
- A system is put in place to oversee customer audits, regulatory inspections and Company certifications/accreditations as applicable.
- A system is put in place to a) share audit and regulatory inspection findings and learning with the relevant functional units and top management, b) promote auditing-in-tandem, and cross-pollination of auditors, c) track all internal and external audits, customer audits and regulatory inspections, and d) track status of findings (open, closed or pending) made during audits and regulatory inspections.

- Liaison is maintained with functional units, affiliates, and human resources for continued personal and professional development (basic and advanced knowledge-based and skill-based training and retraining) of employees worldwide.
- Liaison is maintained with and between functional units and affiliates to promote standardization, improve communication, and to enhance efficiency of quality systems through cooperation.
- All functional units and affiliates are kept up-to-date with various established and emerging local, national, regional and international legal, ethical and regulatory standards.
- Continual quality improvement initiatives (adoption of industry best practices: determination, development, implementation and monitoring of key performance indicators; and internal and external benchmarking) are identified, implemented and monitored via the Plan–Do–Check–Act (P–D–C–A) cycle.
- Persons responsible for the quality assurance system are available in an advisory role to employees worldwide on matters related to the quality systems, regulations in force including GxPs and regulatory compliance.

STANDARD OPERATING PROCEDURES

Standardization is defined as an activity that gives rise to solutions for repetitive application to problems in various disciplines including science and it is aimed at achieving the optimum degree of order in a given context. Generally, the activity consists of the process of establishing (determining, formulating, and issuing) and implementing standards. Therefore, standards are the ultimate result of a standardization activity and within the context of quality systems consist of quality documents or documents related to the

quality systems.

The quality documents consist of Company policies, quality management plan, SOPs, working instructions, conventions, guidelines, forms, templates, logs, tags and labels. They are established by consensus and approved by a nominated body and they provide for common and repeated use, rules, guidelines or characteristics for activities or their results with a view to promote transparency, consistency, reproducibility, interchangeability and to facilitate communication. The hierarchy and types of quality documents relevant to quality systems will depend upon Company business objectives and business model. SOPs are Level 2 quality documents and, along with other relevant quality documents, ensure the effectiveness and efficiency of quality systems.

The ICH GCP guideline defines SOPs as “detailed, written instructions to achieve uniformity of the performance of a specific function”.Simply put, SOPs specify in writing, who does what and when, or the way to carry out an activity or a process. SOPs establish a systematic way of doing work and ensure that work is done consistently by all persons who are required to do the same task. SOPs must be well written in order to provide an effective control of GCP and prevent errors from occurring, thereby minimizing waste and rework. Poorly written SOPs are a source of misinformation. To be user friendly, they should be clear, unambiguous and must be written in plain language. SOPs are controlled documents and are best written by persons involved in the activity, process or function that is required to be specified or covered in the SOP. SOPs must be reviewed prior to their approval for release, for adequacy, completeness and compliance with Company standards and all applicable legal, ethical and regulatory requirements. They must be reviewed and updated as required over their life cycle and any changes made

to the SOPs must be re-approved. They must bear a revision status on them and their distribution must always be documented and controlled. When obsolete SOPs are required to be retained for any purpose, they should be suitably identified to prevent unintended use. Only relevant SOPs in their current version must be available at points of use and must remain legible. SOPs are mandatory for the implementation of GCP and other GxPs, namely, cGMP and GLP, within the scope of quality systems; therefore, it is well said that without SOPs there are no GxPs: no SOPs, no quality systems, and no GxPs.

For an activity to become the topic of an SOP, it must be either subject to regulations or it must address a task important within quality systems or between quality systems and other functional units. Quality systems related SOPs should generally cover the following topics in order to capture the core quality control and quality assurance activities and processes:

Definition, format, content, compilation, indexing, review, approval, update, distribution and archiving of quality documents;

Definition, format, content, review, approval, update, distribution and archiving of quality management plan;

Definition of and activities related to quality control of clinical trials and compilation of trial-specific quality control plan;

Initiation and maintenance of personnel files including format and content of curriculum vitae, job description, training records and personal and professional development plan;

Top management reviews of quality systems and issuance of management review reports;

Selection and management of contract auditors;

Format, content, compilation, review, approval, update, distribution and archiving of audit program;

Format, content, compilation, review, approval, update, distribution and archiving of audit plan;

Planning, conduct, reporting and close-out of risk-based internal and external audits;

Planning, conduct, reporting and close-out of specific audits of sites, processes, systems and documents: sponsor site, third party (CRO, central clinical laboratory) site, investigator site, quality management system including SOP management, education and training and auditing, document management system including archives, data management system including information technology support, serious adverse events management system, pharmacovigilance system, medical dictionary management system, and regulatory submission documents (clinical trial reports, and clinical sections of new drug applications, marketing authorization applications, and common technical documents);

Planning, conduct, reporting and close-out of for cause/directed audits;

Hosting of customer audits;

Preparation of sites for regulatory inspections;

Coordination and management of regulatory inspections;

Format, content, compilation, review, approval, update, distribution and archiving of CAPA plan, and assessment of its effectiveness;

Change control to ensure that changes and the current status of quality systems related components including documents are identified; and

Roles and responsibilities of quality assurance in handling of scientific misconduct/fraud.

BENEFITS OF QUALITY SYSTEMS

The importance of properly established and managed quality control and quality assurance systems with their integral well-written SOPs and other quality documents for the achievement of Company business objectives cannot be ignored. They serve as a passport to success by assisting the Company to achieve high-quality processes, procedures, systems, and people, with eventual high-quality products and services and enhancement of the following:

- Customer satisfaction, and therefore, customer loyalty and repeat business and referral;
- Timely registration of drugs by eliminating waste and the need for rework;
- Operational results such as revenue, profitability, market share and export opportunities;
- Alignment of processes with achievement of better results;
- Understanding and motivation of employees toward the Company quality policy and business objectives, as well as participation in continual quality improvement initiatives; and
- Confidence of interested parties in the effectiveness and efficiency of the Company as demonstrated by the financial and social gains from Company performance and reputation.

OVERALL FACTORS AFFECTING BUILDING CONSTRUCTION PROJECTS

Combining the results of the literature review with the results of the Nominal Group Technique session, the overall factors affecting quality were identified. These factors were aggregated into fourteen groups (main factors). Each group is divided into sub- factors as shown in Table 1.Table 1: Factors Affecting Quality of Building Construction Projects in Gaza Strip

TABLE 4 FACTORS AFFECTING QUALITY OF BUILDING CONSTRUCTION PROJECTS

No	Main Factor	Sub-Factors
1.	Project	Scope of the project (type and nature) Location of the project Site access Period of the project
2.	Design	Completeness and consistency of design documents Drawings are prepared in full details Conformance to codes and standards Adherence to specifications Bill of quantity is detailed and accurate
3.	Contract	Cooperation between parties involved in contract Pervious successful relations between parties A written contract with clear conditions Using a standard contract Types of awarding system

4.	Material	Using a comprehensive material management system Cooperation between contractor and material suppliers Availability of good quality construction materials Using storage and handling system Construction materials monopoly
5.	Labor	Labor management system Using labor with high experience Using motivation system Training courses for labor Income level and wages of labor
6.	Equipment	Availability of equipment Equipment management system Measurement of equipment productivity Good utilization of equipment Equipment maintenance
7.	Subcontractors	Company's procedures of selecting subcontractors High cooperation between subcontractors and general contractor Using a system to evaluate subcontractors performance Good and fair subcontract conditions
8.	Site layout	Site layout is large Site layout is organized well Site layout has storage areas for materials

		Site layout is clean
9.	Systems	Software and computer applications Implement quality control and assurance system Using time schedule Using cost control system Implementing a safety program
10.	Site staff	Cooperation between Supervision and Contractor's staff Understanding of contract administration by Supervision Skill and experience of Supervision staff Skill and experience of Contractor's staff
11.	Execution	Using integrated project execution system Testing for final products only Clear procedure for accepting performed activities Preparing and using shop drawings
12.	Financial Issues	Amount of contractor's cash flow Non-delay of interim payments
13.	Owner	Nature of Owner's organization (Public or Private) Owner's quick response (no delays in making decisions) Owner's contribution to design Owner's emphasis on quality
14.	Environment	Socio-economic environment Stability of Political environment The relations between construction industry

		and other industries

Quality Assurance vs. Regulatory Affairs: What's the Difference?

The line between regulatory affairs and quality assurance can sometimes be difficult to distinguish, but there fundamental differences that set the two disciplines apart.

Regulatory affairs is an industry tasked with overseeing how certain products are developed, tested, manufactured, marketed, and distributed to ensure each process is compliant with the relevant regulatory statutes implemented by various regulatory agencies. **Quality assurance**, on the other hand, ensures a company's products meet quality standards for distribution to the market. These include both internal and industry standards, as well as safety standards set by local, state, national, and international governing bodies.

Even with these distinctions in mind, there are still some areas in which these two fields overlap and mirror one another. For example, professionals working in both regulatory affairs *and* quality assurance are expected to understand and stay abreast of changes in governmental regulations and standards.

There may even be cases when professionals in the two fields are required to work together. For example, a business that manufactures or processes food might employ both regulatory affairs specialists and quality assurance specialists, who may rely on much of the same information, KPIs, and methods, but for different reasons.

What are the objectives of a construction company?

To provide the highest level of service in the **construction** industry while offering superior craftsmanship to every project, we handle. To continually innovate, develop and adopt state-of-the-art technology in methods and materials to enhance productivity and cost effectiveness

What are the objectives of a construction project?

Planning comprises defining **objectives** of the **project**, sequence of **works**,**construction** methods, planning of resources, preparing estimation, and durations for various activities to bring about the satisfactory completion of **project**.

When a project meets these goals, the project team has completed it successfully.

- Project Objectives. The three critical aspects of a project are function, cost and timing.
- Function. The most important objective of a project is to perform the functions for which it was initiated. ...
- Cost. .
- Timing.

Our Visions

To become the leading construction firm, while delivering projects that consistently exceed international standards and provide exceptional customer satisfaction.

To continually deliver excellent value & innovative construction solutions to meet our clients' requirements.

Using modern principles and sophisticated technologies, Alamiah Building Company envisions being the primary preference at all times both nationally

and globally, for their renowned excellence, quality, performance and reliability in all types of constructions.

Our Missions

To be a leading construction company in the global market.
To become the customers' most preferred choice by attaining excellence in quality and timely completed value added projects.
To provide the highest level of service in the construction industry while offering superior craftsmanship to every project, we handle.
To continually innovate, develop and adopt state-of-the-art technology in methods and materials to enhance productivity and cost effectiveness.
To continually improve the competence of our team, and employ diverse, innovative & results-oriented personals, motivated to deliver excellence.
To build a safety culture aimed at continually reducing the frequency severity rate towards achieving zero accidents.
To identify and mitigate all the environmental impacts arising from our activities, and comply with applicable environmental norms.

QUALITY CONTROL TECHNIQUES

Introduction

Quality of product and services determines success or failure of the organization. Consumers expect the company to maintain high-level of quality and consider it an important aspect of satisfaction. Quality management, therefore, becomes very important as far as any organization is concerned. Quality management can be accomplished through various quality control techniques. Quality assurance and quality control are objective oriented and can be achieved through statistical quality control.

Statistical quality control requires usage of acceptance sampling and process control techniques. Statistical quality control extensively uses chart to measure the acceptance level of the product samples. Objective is to ensure that products fall within pre-decided upper control and lower control limits. Any sample falling outside the limits is inspected further for corrective action.

Quality Control

The quality of product or service is ensuring if proper designing process is followed. This designing process needs to be backed by appropriate process design supported by a suitable technology which confirms to requirements of customers. Quality control ensures that defects and errors are prevented and finally removed from the process or product. Therefore, quality control should include; planning, designing, implementation, gaps identification and improvisation. If organization can implement a stringent quality control than following benefits are possible:

- Reducing product defects lead to less variable cost associated with labor and material.
- Reduction in wastage, scrap and pollution.
- Ability to produce quality products over longer period of time
- With quality maintenance needs for inspection reduces leading to decrease in maintenance cost
- Large pool of satisfied customers.
- Increase in employee motivation and awareness of quality.
- Increase in productivity and overall efficiency.

Above mentioned points are relevant not only for production stage but are equally important for input material, manufacturing process, delivery process, etc.

Statistical Quality Control

Quality control techniques require extensive usage of statistical methods. The advantages of the statistical analysis are as follows:

- Statistical Tools are automated and therefore, require less manual intervention, leading cost reduction
- Statistical tools work on a model thus are very useful where testing requires destruction of products.

Statistical Quality tools can broadly be classified into following categories:

- Acceptance sampling is an important part of quality control wherein quality of products is assessed post production.
- Statistical process control helps in confirming whether the current process is falling within pre-determined parameters.

Acceptance Sampling

Acceptance sampling is done on sample's post production to check for quality parameters as decided by the organization covering both attributes as well as variables. If the sample does not meet the required parameters of quality than that given lot is rejected, and further analysis is done to identify the source and rectify the defects. Acceptance sampling is done on the basis of inspection, which includes physical verification of color, size, shape, etc.

The major objectives of inspection are:

- To detect and prevent defects in products and process.
- To identify defected parts or product and prevent it from further consumption or usage.

- To highlight the product or process defect to appropriate authorities for necessary and corrective actions.

Scope of inspection covers input materials, finished material, plant, machinery etc.

To sustain quality of product and services it is important to have in place robust quality control techniques

What are the techniques of quality control?

The quality control tools and techniques discussed in this article are:

- **Cause and Effect Diagrams**.
- Control Charts.
- Flow-Charting.
- Histogram.
- Pareto Chart and Pareto Analysis.
- Run Charts.
- Scatter Diagrams.
- Statistical Sampling.

What are quality assurance techniques?

Software **quality assurance** refers to monitoring the software engineering processes and **methods** used to ensure **quality**. Various **methods** are employed for this, such as ensuring conformance to one or more standards, such as ISO 9000 or a model such as CMMI.

Quality appraisal as part of the systematic review: a review

of current methods

Introduction

Over recent years there has been a dramatic rise in the volume of published literature which makes it almost impossible for relevant stakeholders, including patients, clinicians, researchers and commissioners, to keep abreast of developments in physiotherapy and related fields (Carroll et al 2008). The systematic review is one approach that has been designed to address this difficulty (Assendelft et al 1995) with the aim of synthesizing the findings of primary studies on a single topic in order to assess the overall clinical impact and relevance of that body of literature. This popular research method utilizes systematic and transparent means to identify, select, quality appraise and synthesize research and frequently underpins national and international practice guidelines (Hettinga et al 2008, Higgins and Green 2009). To facilitate the process of quality appraisal and synthesis many systematic reviews in the field of physiotherapy have adopted rating scales to assign a numerical value to the quality of a research study (Barr et al 2009; Paratz and Stockton 2009; Tang et al 2010). There are many published rating scales available which tend to take the form of a checklist comprised of criteria, e.g. randomisation, level of blinding, which are thought to be important factors in determining the degree of potential bias in the research which in turn would affect the internal and/ or external validity of the study (Maher et al 2003, van Tulder et al 2003). The checklist is used as the basis of a quality appraisal and a value is assigned depending upon the number of criteria met or not met. The study is subsequently judged as being of high, moderate or low quality which is reflected in the final synthesis where high quality studies carry greater weight. Despite the likelihood of methodological flaws and hence potentially unreliable evidence, low quality studies are usually still included in the synthesis which

might influence the overall conclusions drawn in an unpredictable way (Hettinga et al 2008)

Discussion

The validity of different systematic review methods, particularly quality appraisal using numerical rating scales and the inclusion of low quality studies, has been raised in the literature (Hettinga et al 2008, Littlewood and May 2007, Slavin 1995, van der Velde et al 2007). It has been recognized that different approaches to quality appraisal in systematic reviews may yield different results. These results may also be at odds with large randomized controlled trials (RCT's) with the same focus which are regarded as the 'gold' standard of evaluative research by many (LeLorier et al 1997, van der Velde et al 2007).

Firstly, considering the impact of low quality primary studies on the conclusion drawn by a systematic review, it is suggested that inadequate attention to key design features including sample size, allocation and level of blinding (Kjaergard et al 2001, Moore et al 1998) during the planning and execution of research studies may serve to create an over or under exaggeration of diagnostic accuracy or treatment efficacy (Hettinga et al 2008). Hence the inclusion of low quality studies when synthesizing data may give rise to inaccurate conclusions. It has been put forward that summating these studies through meta-analysis or a qualitative synthesis may guard against this effect; however this assumption should be challenged because synthesis cannot take into account the direction or extent of bias in individual studies (Kjaergard et al 2001, LeLorier et al 1997, Slavin 1995). Thus, it is perhaps not surprising that many systematic reviews which include low quality studies within their synthesis identify conflicting findings between studies or arrive at unclear conclusions (Ho et al 2009, May et al 2006, van Trijffell et al 2005)

As well as considering the impact of inclusion of low quality studies, it has also been suggested that analysis by quality score neither adjusts nor removes the bias of studies (NHMRC 1999). Hence even studies regarded as high quality determined by meeting a certain number of criteria from a numerical checklist may have key design flaws which render the study scientifically inadmissible. Examples of this exist in published systematic reviews, e.g. Tang et al (2010), where RCT's are regarded as high quality even in the absence of key design features such as concealed allocation, assessor blinding or intention to treat analysis. Because systematic reviews of this nature take into account the quality of the studies when synthesising results and drawing conclusions the arbitrary cut-off point encouraged by the use of checklists might have a significant impact upon the validity of the conclusions drawn.

To address these concerns alternative methods have been proposed. The best-evidence synthesis approach to the systematic review follows the main conventions of other approaches to the systematic review process, but does not assign relative quality values to included studies based upon checklists (Carroll et al 2008, Slavin 1995). Instead, the studies that meet the pre-defined inclusion criteria for the review are appraised by the systematic review team based upon predefined guidelines and the studies are judged as being scientifically admissible or not. This process relies on the skill and expertise of the review team, which in itself might be a source of potential bias, and where a study is not regarded as scientifically admissible it is rejected from the review process

A study by van der Velde et al (2007) sought to evaluate the impact of different approaches to the systematic review process upon the conclusions of the relevant review. The best evidencesynthesis approach and the approach based upon The Cochrane Back Review Group Guidelines were adopted. The authors, including advocates of both approaches, recognised the methodological shortcomings of the different approaches. With respect to the Cochrane

approach, van der Velde et al (2007) suggested that most limitations associated with this approach were related to the use of a checklist to appraise quality. They recognised that only methodological weaknesses included in the Cochrane checklist were evaluated and other factors, e.g. validity of outcome measures used, were overlooked. They also recognised that the use of a non validated cut-off point to assign a quality rating to the included studies, as discussed above, in association with the inclusion of methodologically weak studies was likely to introduce bias into the results of the review. In contrast to this, these authors suggested that the weaknesses associated with the best-evidence synthesis approach lay with a less structured approach to quality appraisal which was reliant upon the composition and competence of the systematic review team. This paper concludes by recognising that different approaches to the systematic review process may result in different outcomes which consumers of the literature need to be aware of when interpreting the conclusions of reviews. Other work, e.g. Hettinga et al (2008) have also identified that different approaches to the systematic review, including when low quality studies are maintained in the review, produce conflicting results.

In summary, this paper has identified three main issues that should be recognized when conducting and appraising systematic reviews. Firstly, including low quality studies with fatal flaws might introduce significant bias into the findings of systematic reviews. Secondly, quality appraisal using numerical checklists does not guard against bias and when employed in isolation might not be a useful way of assigning relative quality. Thirdly, a review process which is reliant upon the skill and composition of a systematic review team making qualitative judgments may not be regarded as a robust and transparent process.

Implications for practice

Despite the limitations we recognize that the systematic review remains superior to the narrative review process which does not include mechanisms to minimise bias. However, the above discussion offers insight into features of systematic review design that we should be mindful of when critically appraising and making decisions about the trustworthiness of the findings to influence clinical decision making. Clearly there is also an argument that more consideration should be devoted to the conduct of future systematic reviews. Building upon these issues it is suggested that as part of the systematic review process, consideration should be given to omitting studies that are not regarded as scientifically admissible, the definition of which is taken from current literature and expert opinion where needed. Pre-definition of what constitutes scientific admissibility in a research study offers a structured and transparent approach in contrast to other methods currently in use. For example, in relation to the RCT current thinking suggests that type of allocation, blinding and appropriate sample size are key design features that when absent or compromised might introduce bias into the results of RCT's (Kjaergard et al 2001). Other features, including the validity of outcome measures, may warrant consideration before inferring that studies are scientifically admissible as part of the review process. Hence rather than simply considering the types of studies, participants, interventions, comparisons and outcomes (PICO) as a means of including studies we are suggesting that the key components of the methodology that would contribute to scientifically admissibility should form part of the inclusion and exclusion criteria of the review, hence the acronym PICOM. This addition recognises the impact that research methods might have and it is suggested that the addition of this process would add credibility to the findings of systematic reviews and hence may be a stronger basis upon which to develop clinical practice. As with conventional reviews, it is at this point where studies have been identified as suitable for inclusion that further quality appraisal could be

undertaken, using established scales, to indicate the relative quality of the included studies.

This modification to the process would seem to complement contemporary systematic review methods for which there is a plethora of guidance available regarding how to conduct a high quality systematic review, including the Cochrane Handbook (Higgins and Green 2009) and the NHMRC guidelines (1999), and hence it seems unnecessary in a paper of this nature to repeat this work.

Conclusion

In light of the limitations associated with current systematic review methods and the different conclusions that these methods may deliver it seems that there is an argument emerging for the physiotherapy profession to consider re-evaluating the status of its research base by conducting further systematic reviews which omit low quality studies with a high potential for bias, reduce reliance on numerical rating scales to infer quality whilst offering a current, robust and transparent approach to quality appraisal and data synthesis as part of the systematic review process

Quality appraisal in systematic reviews of normative literature. A problem analysis

Systematic reviews aim at searching, selecting, analyzing and synthesizing scientific literature in a transparent and systematic way in order to inform decision-making in the health care system on the basis of the best available evidence. In recent years, such reviews have also gained importance also in bio-, public health- and research ethics, as well as in health technology assessment. Such reviews do not only analyze ethically relevant empirical literature (e.g. on risk and benefit), but normative literature as well, i.e. literature consisting of ethical arguments. As the appraisal of the literature that should be included is

paramount for a systematic review, the problem of how to appraise the quality of normative literature arises. This problem has not yet been solved satisfactorily. After developing a pragmatic definition for "normative literature", a typology of different types of systematic reviews of normative literature is presented. Based on existing approaches for quality appraisal, this paper identifies three possible strategies for solving the problem of quality appraisal of normative literature, and discusses their respective strength and weaknesses relative to the different types of systematic reviews. It becomes apparent that none of the existing approaches is able to solve the problem of quality appraisal in a general and convincing way. The paper concludes with stating minimal conditions regarding the elaboration of future strategies, and outlines a promising strategy that is theoretically acceptable and practically feasible.

Critical appraisal is the process of carefully and systematically assessing the outcome of scientific research (evidence) to judge its trustworthiness, value and relevance in a particular context. Critical appraisal looks at the way a study is conducted and examines factors such as internal validity, generalizability and relevance.

Some initial appraisal questions you could ask are:

1. Is the evidence from a known, reputable source?
2. Has the evidence been evaluated in any way? If so, how and by whom?
3. How up-to-date is the evidence?

Second, you could look at the study itself and ask the following general appraisal questions:

1. How was the outcome measured?
2. Is that a reliable way to measure?
3. How large was the effect size?
4. What implications does the study have for your practice? Is it relevant?
5. Can the results be applied to your organization?

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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF CIVIL ENGINEERING

UNIT IV - SAFETY AND FAILURE ASPECT IN CONSTRUCTION – SCI 1614

Construction accidents- human factors in construction safety- safety programmes-job site safety assessment- safety meeting- safety incentives- owners responsibility for safety- Role of designer for ensuring safety

CONSTRUCTION ACCIDENTS

India's 80% construction sites "unsafe", deaths 20 times higher than those in Britain. The Government of India may be seeking to project India's construction sector as the country's second-largest employer of the country after agriculture, providing jobs to more than 44 million people, and contributing nearly 9% to the national GDP, yet, ironically, its workforce is more unprotected than any other industrial sector of the country. Data suggest that the possibility of a fatality is five times more likely in the construction industry than in a manufacturing industry, and the risk of a major injury is 2.5 times higher. A recent seminar in Ahmedabad, organized by the Bandhkam Majoor Sangathan (BMS) with the participation of workers, activists, builders, occupational health experts and government officials, was told that a British Safety Council study reveals revealed that not only do construction workers in India enjoy no legal protection, their on-site deaths is 20 times higher than those in Britain, 25% of the deaths result from falling from a height, and nearly 80% of the workers work in unsafe environment.

"Ironically, this is one of the rare data that we have on construction workers in India", said Vipul Pandya of BMS, which workers among Gujarat's construction workers. "All that we know, from random sources, is that 38 construction workers die every day working on sites. However, neither the Government of India, nor the International Labour Organization, has any authentic data which could suggest the plight of a sector which employs such a huge workforce."

An attempt to collect data by Pandya with the help of BMS volunteer Darshan Patel, a civil engineer by profession, has revealed that in Gujarat – which accounts for nearly 13% of all construction sector investment in the country, next only to Maharashtra (25%) – the number of deaths as a result of fatal accidents were 137 in 2018, the highest in a decade. In 2017, there were 67 deaths, 2016 saw 55 deaths, 2015 saw 62 deaths, and 2014 saw 69 deaths.

Obtained by filing Right to Information (RTI) pleas with Gujarat Police and newspaper clippings, the data further show that 49% of the deaths in Gujarat took place by falling from height, followed by 21% deaths by buried under debris. In 74% of accidents, no FIR is registered. “FIR is registered only in cases of death. Even if the injury disables a person for a longer period, no FIR is registered”, says Patel.

Other data suggest that 38% of the victims of the accidents at construction sites were in the age group 19-28, followed by 16% in the age group 29-38; 37% were locals, followed by 21% from another village or town in the state, and 17% from outside Gujarat; 84% of victims worked on private sector sites, while the rest were from state-owned sites; and while Ahmedabad experienced 15% of fatal accidents, followed by Rajkot (14%) and Vadodara (12%), as many as 39% accidents took place among smaller cities or towns.

Reasons for so many fatal accidents are many, including lack of awareness among workers ranging from contractors refusing to enforce safety equipment on workers at construction sites, lack of awareness among workers, and lack of government site inspection (there is just one inspector in India for every 506 registered units). “Even civil engineers, who are the key persons to oversee construction, are not trained into safety”, said structural engineer Rajendra Desai.

Apart from fatal accidents, the construction industry workers are at risk of getting several occupational diseases, including dermatitis, asbestosis, silicosis,

muscular skeletal disorder, respiratory diseases, etc., all of which lead to disability and slow death. These could be avoided in case there are enough physicians who are experts in occupation disease

Dr Kamlesh Sarkar, director, National Institute of Occupational Health (NIOH), said, “No doctors are taught about occupational health. I am trying to push the government towards this.” Suggesting how preventive care can help overcome some of the diseases, Dr Sarkar said, “The workers shouldn’t be made to work in the afternoon when the temperature is high. Telangana has taken such a step, which is now being followed by Tamil Nadu.”

Dr Shyam Pingle, occupational health specialist with the Indian Institute of Public Health (IIPH), Gandhinagar, said, “There is just one occupational diseases course of three months in the country. It began after the Bhopal gas disaster. In all, 2,800 doctors have so far taken up the course. There are just four Employees State Insurance (ESI) centres for occupational diseases in the country – none of Gujarat.”

The result is, lack of awareness about occupational diseases in India. “In India, there were 70,000 to 80,000 workplace accidents in 2011. However, there were 3,20,000 cases of occupational diseases, which is four times as high. Unfortunately, we are unable to see slow death because of such diseases”, said Dr Pingle.

The government's attitude for such state of affairs remains under scanner. The Gujarat government has started 36 Dhanvantari mobile clinics, which go to construction sites for health checkup. However, admits Dr Amrish Vaidya, involved with the state government, none of the mobile clinics have occupational disease specialists. The data collected under the scheme suggest higher percentage of occupational diseases: 25% suffered from respiratory

issues, 12% from skin diseases, and 10% from body ache. There is no way workers can get compensated in case of long-term disability as a result of either an accident or an occupational disease. Testimonies suggested that a worker in Keshod, Junagadh district, who fell down from a height, was without wages for 15 days when he couldn't go to work. Another worker was told he couldn't be compensated for his disability because he was "not registered" with the state welfare board.

A third one, a woman worker, met with a major accident. While the contractor agreed to support the worker till she fully recovered, the support stopped after three more months, though the disability continued for six months. "Women, accompanying their husbands to work to construction sites, are mostly illiterate and unskilled, hence are made to do heavy manual work, delivering bricks and other construction material. This puts them at risk with muscular skeletal diseases", said Ramilaben of the Self-Employed Women's Association, Ahmedabad

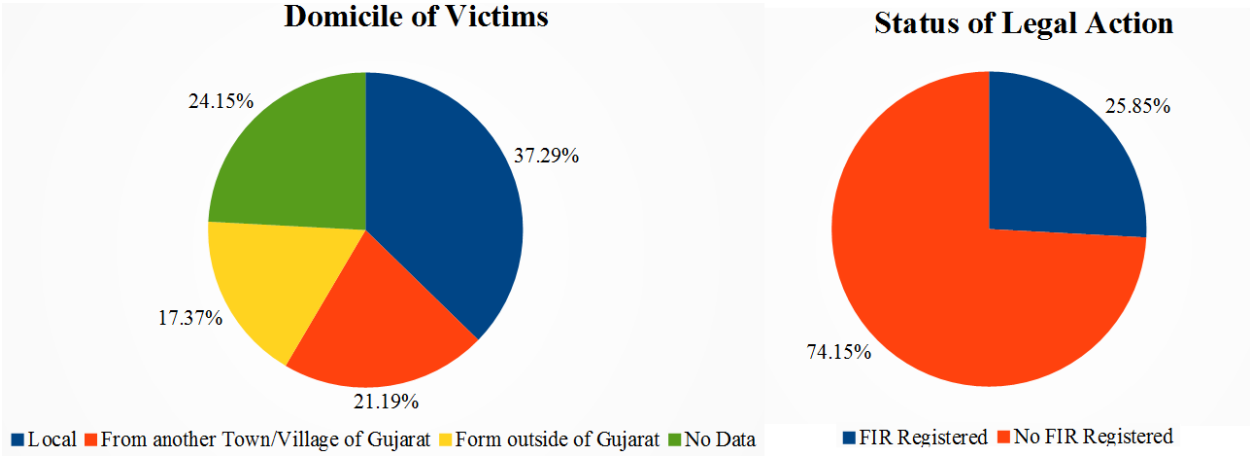


FIG.1 DOMICILE OF VICTIMS AND LEGAL ACTION STATUS

TABLE 1 CONSTRUCTION ACCIDENT DATA

YEAR	LIFE LOSS
2008	**90**
2009	**92**
2010	**109**
2011	**100**
2012	**120**
2013	**89**
2014	**69**
2015	**62**
2016	**55**
2017	**67**
2018	**137**

Construction accidents TOI

No ambulances for accident victims (20 JUN 2020)

Get faster performance & optimal storage with latest tech.

Greater Noida: Boy falls from sixth floor of construction site, dies

Five construction laborers fall to death every month in Bengaluru

09 FEB 2020.

Kolkata: NKDA starts health monitoring camps at construction

Safety in Construction Sites

INTRODUCTION:

Construction sites are dangerous places where injury or death or illness can cause to workers. These can happen due to electrocution, falling from height, injuries from tools, equipment and machines; being hit by moving construction vehicles, injuries from manual handling operations, illness due to hazardous substance such as dust, chemicals, .etc. Even a nail standing up from a

discarded piece of wood can cause serious injury if trodden on in unsuitable shoes.

Statistics of accidents in the construction industry in India are scarce. The rate of accidents on construction industry is very high not only in India but also in many other countries including the developed. Statistics of UK, USA and some other countries indicate that the industry has a very high hazard potential and high incidence of fatal accidents. For example, the average yearly rate of accidents for 1000 worker in the construction industry in UK is approximately 4 times the corresponding average rate of all manufacturing industries. This article will focus on various aspects of safety in construction sites. However, it does not deal with the aspects relating to the use of personal protective equipment in construction sites, which will be dealt in a separate article.

Indian Scenario

The construction is the second largest economic activity in India after agriculture. It has accounted for around 40% of the development investment, during the past 50 years. Around 16% of India's working population depends on construction for its livelihood. The Indian construction industry employs over 35 million people and creates assets worth over Rs.200 billion. Construction accounts for nearly 65% of the total investment in infrastructure. Investment in construction accounts for nearly 11% of India's GDP. The market size of the construction industry for the 12th Five Year Plan period indicate that the aggregate output of the industry during the period 2012-13 to 2014-17 is likely to be 52.31 lakh crores.

The construction industry is expected to pick up further momentum during the 12th Five Year Plan. The plan aims at accelerating the process of implementation of the provisions of the Building and Other Construction

Workers (Regulation of Employment) and Conditions of Service Act 1996. Indian construction industry comprises about 200 firms in the corporate sector. In addition to these firms, there are about 1,20,000 Class A contractors registered with various government construction bodies. Also, there are thousands of small contractors, which compete for small jobs or work as subcontractors of prime or other contractors. The National Crime Records Bureau, of the Government of India compute some data on the accidents reported in India for the construction industry. The data revealed by them for year 2012 & 2013 are given in Table below

It may be seen from the above Table that "Falls" accounts for highest causes of deaths in construction sites i.e. 12803 deaths in 2013, which is about 3.2% of the total accidental deaths reported in India for the year 2013. It may also be seen from the above Table that during the year 2013, about 10218 persons died due to electrocution, which had shown an increase of 1468 deaths compared to the year 2012. During the same period about 1690 deaths occurred due to fire, which had caused due to short-circuits. Safety in construction is a matter of concern in India. The construction sector is the most vulnerable segments of the unorganised labour in India. It is estimated that about 165 per 1000 workers get injured in the construction sector. The rate of fatal accidents in construction sector is 4 to 5 times that of the manufacturing sector.

A large number of construction workers are exposed to the risks of workplace accidents and occupational health problems such as manual handling, noise and vibrations, exposure to various hazardous chemicals in particular cement, asbestos, welding fumes, etc… Accidents and illness can be extremely costly for a construction firm. A worker who becomes ill or injured as a result to unlawful negligence can sue for compensation, which could turn into a significant amount, if it is proved as a serious injury or illness.

Indian Regulations:

There are a number of Indian regulations dealing with the working conditions of construction workers. The main Indian regulations are:

1. Building & Other Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996.
2. Building & Other Construction Workers (Regulation of Employment and Conditions of Services) Central Rules, 1998.
3. Building & Other Construction Workers Welfare Cess Act, 1996.

These rules came into force on 19-11-1998. These rules apply to all buildings and other construction work relating to any establishment in which appropriate government is the Central Government. Some of the other statutory provisions/codes in force to take care of the working conditions of the construction workers are:

1. The Fatal Accidents Act, 1885,
2. The Factories Act, 1948,
3. The Workmen's Compensation Act, 1923,
4. The Employees State Insurance Act, 1948,
5. The Central Labour (Regulation & Abolition) Act, 1970,
6. The National Building Code of India, 2005

Site Preparations:

Preparation of a construction site is an important aspect which should focus on a good site layout, easy access to the site and easy movement of vehicles in the site.

Site Layout: A badly planned and untidy construction site can lead to many accidents at construction sites, which may arise from: (i) fall of materials, (ii)

collision between the workers, (iii) plant or equipment. To avoid the above causes of accidents, a good layout of the site is a must. While preparing the site layout, at-most care should be taken to avoid overcrowding the site. Also enough space should be provided for the movement of men, material and construction equipment within the site.

Easy Access: The construction sites should have easy and safe access. In this respect, the following parameters should be taken into consideration:

- Everyone should be able to get into the work site safely.
- Edges of Scaffolds/Platforms from where people could fall are provided with double guard rails or other suitable edge protection.
- Holes and pits are protected with clearly marked and fixed covers and barricades to prevent falls.
- Site should be kept tidy and good housekeeping should be practiced.
- Provide good/adequate lighting in all locations of the site.
- The site should be fenced off from the public.

Movement of Vehicles: It is a common sight on the construction site that many vehicles (trucks, cranes, fork lifts, etc.) carrying construction materials move criss-cross on the construction site, which results in a number of accidents and mishaps. Construction sites often operates on ground, which is muddy and uneven, and where driver visibility is poor. People walking on the site are injured or killed by moving vehicles especially reversing ones. Many workers, particularly drivers and operators are killed by overturning vehicles. Hence, at-most care should be taken for the movement of vehicles on the construction sites. The following points should be taken into consideration, while moving the vehicles on the construction site:

- Vehicles and pedestrians should be kept apart on site, i.e. separate them as much as possible using barriers.
- Adequate clearance should be provided around vehicles.
- As far as possible, avoid reversing the vehicles. It is better to use one-way system.
- Vehicles used on the sites must have reversing alarms/sirens.

Site Operations:

The type of operations/activities carried out in a construction site are many (See Fig.01) and they vary from site to site. However, all of them should be carried out only with due regard to safe operations. Some of the routine work/operations carried out in construction sites are listed below:

- Excavation Work
- Scaffolding Work
- Crane Operations
- Hoisting Operations
- Forklift Operations
- Ladder Safety
- Electrical Safety

Excavation Work: Excavation work is an important activity in the construction sites. However, many fatal accidents do occur in excavation work, if proper precautions are not taken. Many lives are lost being buried alive in the trenches. It should be remembered here that there is no safe ground that will not collapse and therefore, any trench sites can collapse without any warning.

- All excavation work deeper than 1.25 meters must be shored or battered.
- Excavation deeper than 2 meters must be guarded by rails or barriers.

- Vehicles working, too close to the side of the trench or rubble piled on the sides may cause collapse and therefore at most care should be taken.
- Vehicles tipping into the excavation work must use stop blocks, so as to avoid the collapse of the trench.
- Make sure that the excavation work is inspected daily.
- Make sure that you know where the position of underground pipes and electric cables are laid in the site, so that you will not hit them during the excavation work.

Scaffolding Work: Scaffolds are temporary structures of steel work, timber or bamboo. The criteria for their erection are the same as those for permanent structures. The strength of the scaffolding depends upon the combined strength of individual members. Failure of one or two of them can result in the collapse of the entire structure. Modern scaffolds are invariably made of steel tubes, pre-fabricated in convenient units. They are safer and turn out good quality work. Of course, the steel scaffolds are too costly, but, it would be cheaper in the long run. In spite of the fact that the steel scaffolds are much safer, many of the smaller and medium size builders in India, neglect the safety aspects and prefer to use timber or bamboo scaffolds (See Fig.02) in order to cut the cost. In any case, while erecting the scaffolds, the workers should be forced to wear necessary safety belts with fall arrestors and helmets, so that the fall accidents can be avoided

Crane Operations: Various type of cranes are used in construction sites, which includes (i) Portable Cranes (See Fig.03) (ii) Tower Cranes (Sig Fig.04). A number of accidents are reported in the use of cranes, and many of them could be averted by adopting safe methods of operations. Some of the methods to be adopted for safe crane operations are given below:

- The weight of the load intended to be lifted by the crane must be carefully estimated.
- The crane must be fitted with an automatic safe load indicator.
- The crane must always work on a hard, level base.
- The load must be properly fixed and secured.
- The signal man must be trained to give clear signals.
- The ropes, hooks, chains, slings, etc. used in the lifting operations, must be inspected regularly for their worn out.
- When mobile cranes are used, care must be taken to prevent overturning of cranes.
- Wear appropriate personal protective equipment

Hoisting Operations: Hoists are used to move heavy objects and equipment. The Fig. 05 shows various parts of hoists. As the hoists consists of various components, failure of any one component can lead to disastrous accidents. Therefore these components should be inspected daily. The thumb rule is: if there is any doubt about the working conditions of a hoist, do not use it. The hoist inspections should cover the following aspects: (i) The hooks on all blocks, including snatch blocks, must have properly working safety latches, (ii) All hooks on hoisting equipment should be free of cracks and damage, (iii) The maximum load capacity for the hoist must be noted on the equipment, (iv) Electric cables and wiring should be intact and free of damages. When using hoists, some basic safety rules should be observed, which are given below:

- Never walk, stand or work beneath a hoist.
- Isolate hoisting area with barriers, guards and signs as appropriate.
- Never exceed the capacity limits of your hoist.
- Wear gloves, helmets and other personal protective equipment as appropriate, when working with hoists and cables.

- Ensure that hoists are inspected regularly.
- When the work is completed, always rig the hoist down and secure it.
- When the load block or hoist is at floor level or its lowest point of travel, ensure that at least two turns of rope remain on the drum.
- Be prepared to stop operations immediately of signalled by the safety watch or another person.
- Ensure that the hoist is directly above a load before picking up. This keeps hoist from becoming stressed.
- Picking up loads at odd angles may result in injury to people or damage to the hoist.
- Do not pick up loads by running the cable through, over or around obstructions. These obstructions can find the cable or catch on the load and cause an accident.
- Do not hoist load when any portions of the hoisting equipment within 6 feet of high-voltage electrical lines or equipment.
- If you need to hoist near – voltage electrical lines or equipment, obtain clearance from your electrical supervisor first.

Fork Lift Operations: Fork Lifts are very commonly used in construction sites for movement of many construction materials and stacking them at heights. The Fig.06 shows a line diagram of a Fork Lift with various parts. While operating the Fork Lifts, the following general safety guidelines should be observed

Parts of a fork lift truck – Courtesy: wiki.vpa.mtu.edu

- Do not walk, stand or work under the elevated portion of a fork lift even if it is not loaded.
- Ensure that the fork lift has an overhead barriers to protect the operator from falling objects.

- Do not allow riders on the fork lift.
- Do not raise people on a fork lift.
- Always work within the capacity limits of your fork lift.
- Before modifying the operation or capacity limits of a fork lift, consult with the manufacturer.
- Do not operate a fork lift in an area with hazardous concentrations of acetylene, butadiene, hydrogen, ethylene or diethyl ether, or other explosive environment.
- Never lift a load while moving a fork lift. Wait until you are completely stopped before raising the mast.
- Be sure, the top load sits squarely on the stack. Remember uneven load could topple the fork lift.
- When you want to travel with loads, slightly lift the loads back to provide stability.
- Make sure that you travel with loads at the proper height. A stable clearance height is usually 4 to 6 inches at the tips and 2 inches at the heels of the fork blades.
- When preparing to leave the fork lift unattended, lower the mast, neutralise the controls, shut the power off, and set the brakes.
- If you cannot see over the load, drive in reverse. Do not try to look around a load and drive forward.

Ladder Safety: Ladders are one of the most popular item used in the construction sites for working at heights. However, if not used safely, it can kill a lot of people. The Fig.07 & Fig.08 will depict the wrong and right way of using the ladders. The following safe methods should be adopted while operating ladders:

- Always have a firm grip on the ladder and keep a good balance.

- Never allow more than one person on a ladder.
- Use tool belts or hand line to carry objects when you are climbing the ladder.
- Do not lean out from the ladder in any direction.
- If you have a fear of heights – don't climb a ladder.
- Do not allow others to work under a ladder in use.
- Do not use a defective ladder

Electrical Safety: Electricity can cause great damage to both people working in the construction sites and property. Contact with the electric current can trigger other accidents, like falls from ladders or scaffolding. Electrical shocks or flashes can cause serious injuries such as burns. Electric shock may also cause the victim to stop breathing and nerve centres may be temporarily paralysed. The heart beat may fluctuate or the heat rhythm may actually be interrupted, thus causing a stop in the circulation of blood throughout the body. Apart from human injuries like shock, burns or falls, another major hazard is the situation in which an electrical fire or explosion may occur. Fires and explosions generally cause extensive property & equipment damage. Electrical Fires often start when an overloaded circuit becomes overheated – igniting the insulation around the wires. If cords and cables are frayed or worn out, bare wires might touch each other, thus causing a short circuit that could spark a fire.

If the workers find a fault or malfunctioning piece of equipment, they should take it out of operation, and make the necessary arrangements to have the equipment repaired. Make sure that the workers at the construction site understand the importance of electrical safety and recognise, that abusing or misusing electrical equipment is an invitation to an accident. The workers should also make sure that the work area is safe and free from all electrical

hazards. Provide necessary personal protective equipment in particular, electrical gloves & breathing apparatus.

Conclusion:

The construction is the second largest economic activity in India after agriculture. It contributes more than 5% of India's GDP and about 78% to the gross capital formation. The construction sector is the most vulnerable segments of the unorganised labour in India. About 165 per 1000 workers get injured in the construction sites. The rate of fatal accidents in construction sector is 4 to 5 times that of the manufacturing sector. "Falls" accounts for highest causes of deaths, which is about 3.2% of the total accidental deaths reported in India for the year 2013. A large number of workers are exposed to the risk of workplace accidents and occupational health problems in the constructions sites. Although there are a number of Indian regulations dealing with the working conditions of construction workers, their effectiveness are yet to be felt. No doubt that a worker who becomes ill or injured as a result of unlawful negligence can sue for compensation, which could turn into a significant amount, if it is proved as a serious injury or illness.

It is a fact that in spite of all the efforts taken by some of the elite construction companies and safety enforcement authorities, accidents and illness in the construction sites are still on the rise and lack of awareness was evident in many cases. Hence, more attention should be paid to arouse the safety awareness of construction workers. Above all, everyone who is involved in the construction activity should shoulder the responsibility of identifying the potential hazards and make all efforts to eliminate them from the construction sites. Thus the 'mantra' is that every job on the construction sites must be carried out with at-most safety. (Ref: https://www.isrmag.com/safety-construction-sites/

HUMAN FACTORS IN CONSTRUCTION SAFETY

SAFETY PROGRAMMES

Construction site safety

Construction work is a hazardous land-based job. Some construction site jobs include: building houses, roads, tree forts, workplaces and repair and maintain infrastructures. This work includes many hazardous task and conditions such as working with height, excavation, noise, dust, power tools and equipment. The most common fatalities are caused by the fatal four: falls, being struck by an object, electrocutions, and being caught in between two objects.[1][2] Construction work has been increasing in developing and undeveloped countries over the past few years. With an increase in this type of work occupational fatalities have increased. Occupational fatalities are individuals who die while on the job or performing work related tasks

Overview

In 2014, the United States had 4,679 fatal occupational injuries, an incidence rate of 3.3 per 100,000 full-time employed workers. In the same year, fatal work injuries in construction and extraction occupations increased 5%. One in five deaths of workers in 2014 were construction related.[4] Construction has about 6% of U.S. workers, but 17% of the fatalities - the largest number of fatalities reported for any industry sector.

In the United Kingdom, the construction industry is responsible for 31% of fatalities at work and 10% of major workplace injuries.[5] In South Africa there are 150 fatalities and approximately 400 injuries each year related to construction sites. In Brazil, the incidence rate for all occupational fatalities is 3.6 per 100,000. (Little to no information regarding construction fatalities could

be found in Asia, South American, Africa, and the Antarctic.) The chart below contains more countries and the rate of construction site fatalities

Hazards

The leading safety hazards on construction sites include falls, being caught between objects, electrocutions, and being struck by objects. These hazards have caused injuries and deaths on construction sites throughout the world. Failures in hazard identification are often due to limited or improper training and supervision of workers.[19] Areas where there is limited training include tasks in design for safety, safety inspection, and monitoring safety. Failure in any of these areas can result in an increased risk in exposing workers to harm in the construction environment.

Falls are the leading cause of injury in the construction industry, in particularly for elder and untrained construction workers.[18][20] In the Occupational Safety and Health Administration (OSHA) Handbook (29 CFR) used by the United States, fall protection is needed in areas including but not limited to ramps, runways, and other walkways; excavations; hoist areas; holes; form-work; leading edge work; unprotected sides and edges; overhand bricklaying and related work; roofing; precast erection; wall openings; floor openings such as holes; residential construction; and other walking/working surfaces. Other countries have regulations and guidelines for fall protections to prevent injuries and deaths.

Motor vehicle crashes are another major safety hazard on construction sites. It is important to be cautious while operating motor vehicles or equipment on the site. A motor vehicle should have a service brake system, emergency brake system, and a parking brake system. All vehicles must be equipped with an audible warning system if the operator chooses to use it. Vehicles must have windows and doors, power windshield wipers, and a clear view of site from the

rear window. All employees should be properly trained before using motor vehicles and equipment.

Employees on construction sites also need to be aware of dangers on the ground. Cables running across roadways were often seen until cable ramp equipment was invented to protect hoses and other equipment which had to be laid out. Another common hazard that workers may face is overexposure to heat and humidity in the environment.[*citation needed*] Overexertion in this type of weather can lead to serious heat-related illnesses such as heat stroke, heat exhaustion, and heat cramps. Other hazards found on construction site include asbestos, solvents, noise, and manual handling activities.

Road construction

The American Recovery and Reinvestment Act of 2009 created over 12,600 road construction projects, over 10,000 of which were in progress as of 2010. Workers in highway work zones are exposed to a variety of hazards and face risk of injury and death from construction equipment as well as passing motor vehicles. Workers on foot are exposed to passing traffic, often at high speeds, while workers who operate construction vehicles are at risk of injury due to overturn, collision, or being caught in running equipment. Regardless of the task assigned, construction workers work in conditions in poor lighting, poor visibility, inclement weather, congested work areas, high volume traffic and speeds. In 2011, there were a total of 119 fatal occupation fatalities in road construction sites. In 2010 there were 37,476 injuries in work zones; about 20,000 of those were to construction workers. Causes of road work site injuries included being struck by objects, trucks or mobile equipment (35%), falls or slips (20%), overexertion (15%), transportation incidents (12%), and exposure to harmful substances or environments (5%). Causes of fatalities included getting hit by trucks (58%), mobile machinery (22%), and automobiles (13%).

Road construction safety remains a priority among workers. Several states have implemented campaigns addressing construction zone dangers and encouraging motorists to use caution when driving through work zones. National Work Zone Safety Awareness Week is held yearly. The national event began in 1999 and has gained popularity and media attention each year since. The purpose of the event is to draw national attention to motorist and worker safety issues in work zones

Hazard controls

Site preparation aids in preventing injury and death on construction sites. Site preparation includes removing debris, levelling the ground, filling holes, cutting tree roots, and marking gas, water, and electric pipelines.[Another prevention method on the construction site is to provide a scaffold that is rigid and sufficient to carry its own weight plus four times the maximum intended load without settling or displacement.

Ways to prevent injuries and improve safety include:

- Management safety
- Integrate safety as a part of the job
- Create accountability at all levels
- Take safety into account during the project planning process
- Make sure the contractors are pre-qualified for safety
- Make sure the workers are properly trained in appropriate areas
- Have a fall protection system
- Prevent and address substance abuse to employees
- Review accidents and near misses, as well as regular inspections
- Innovative safety training, e.g. adoption of virtual reality in training

- Replace some of the works by robots (many workers may worry that this will decrease their employment rate)
- Adoption of BIM with three dimensional printing to make the building model first before put into real practice

The employees or employers are responsible for providing fall protection systems and to ensure the use of systems. Fall protection can be provided by guardrail systems, safety net systems, personal fall arrest systems, positioning device systems, and warning line systems. Making sure that ladders are long enough to safely reach the work area to prevent injury. Stairway, treads, and walkways must be free of dangerous objects, debris and materials. A registered professional engineer should design a protective system for trenches 20 feet deep or greater for safety reasons. To prevent injury with cranes, they should be inspected for any damage. The operator should know the maximum weight of the load that the crane is to lift. All operators should be trained and certified to ensure that they operate forklifts safely.

Operational Excellence Model to improve safety for construction organizations

There are 13 safety drivers associated with this model to improve safety for construction organizations:

1. Recognition & Reward
2. Employee Engagement
3. Subcontractor Management
4. Training & Competence
5. Risk Awareness, Management & Tolerance
6. Learning Organization
7. Human Performance
8. Transformational Leadership

9. Shared Values, Beliefs, and Assumptions
10. Strategic Safety Communication
11. Just & Fair Practices and Procedures
12. Worksite Organization
13. Owner's Role[34]

Each safety driver mentioned above has some sub-elements attributed to it

Education and safety

Construction workers need to be properly trained and educated on the task or job before working, which will assist in preventing injuries and deaths. There are many methods of training construction workers. One method is coaching construction site foremen to include safety in their daily verbal exchanges with workers to reduce work-related accidents.[19] It is important that the workers use the same language to assure the best communication. In recent years, apart from traditional face to face safety knowledge sharing, mobile apps also make knowledge sharing possible.

Another method is ensuring that all workers know how to properly use electronics, conveyors, skid-steer, trucks, aerial lifts, and other equipment on the construction site. Equipment on the job site must be properly maintained and inspected regularly before and after each shift. The equipment inspection system will help the operator make sure that a machine is mechanically sound and in safe operating conditions. An employee should be assigned to inspect equipment to insure proper safety. Equipment should have lights and reflectors if intended for night use. The glass in the cab of the equipment must be safety glass in some countries. The equipment must be used for its intended task at all times on the job site to insure workers' safety.

Each construction site should have a construction site manager. This is an occupational health and safety specialist who designs and implements safety

regulations to minimize injuries and accidents. He or she also is in charge of conducting daily safety audits and inspections to ensure compliance with government regulations. Most construction site managers have an entry level experience or higher degree. Before any excavation takes place, the contractor is responsible for notifying all applicable companies that excavation work is being performed. During excavation, the contractor is responsible for providing a safe work environment for employees and pedestrians.

Access and egress are also important parts of excavation safety.[Ramps used by equipment must be designed by a person qualified in structural design. No person is allowed to cross underneath or stand underneath any loading or digging equipment. Employees are to remain at a safe distance from all equipment while it is operational. Employees who have training and education in the above areas will benefit their co-workers and themselves on the construction site.

National Safety Stand Down

Every spring in the United States, many safety organizations sponsor a voluntary week-long campaign to raise awareness about falls in construction, the leading cause of death for construction workers. This event provides employers the opportunity to discuss safety hazards such as falls and how to prevent them. Even if a company doesn't have employees exposed to fall hazards, the safety awareness campaign can still be used to discuss other job hazards, prevention methods, and company safety policies. In 2016, falls from elevation caused 92 of the 115 fatalities in the roofing industry as well as 384 of the 991 overall construction fatalities recorded.[43] In 2016, falls from elevation were the leading cause of construction worker deaths in the U.S., fatally injuring more than 310 construction workers seriously injuring another 10,350 by falls from elevation. In 2016, the main causes of these construction related fall fatalities were falls from roofs (124), ladders (104), and scaffolds (60).

Eighty one percent of deaths from roofs occur in the construction industry, 57% of deaths from ladders occur in the construction industry, and 86% of deaths from scaffolds occur in the construction industry. Several of the top 10 most frequently cited OSHA violations every year involve fall-protection safety standards. Annual number of construction fatalities in the United States are listed in the table below:

The program was originally launched as a two-year project on Workers Memorial Day in 2012 to raise awareness about preventing falls in construction, but due to its success, it has been continued at the start of every construction season.[48] In 2015, over 150 public events were held across the country, with over 150,000 workers and 1.5 million US Air Force personnel participating. Organizations partnering with OSHA to sponsor this annual event include the National Institute for Occupational Safety and Health (NIOSH),[50] the Center for Construction Research and Training (CPWR), the American Society of Safety Professionals (ASSP),[the National Safety Council,[48] and many others. Resources to assist employers in finding activities are also available from multiple sources. The National Association of Home Builders (NAHB) and NIOSH have made several fall-prevention videos available to the public on YouTube, and the National Roofing Contractors Association has published three video webinars available for viewing. The Lergent Developers has published a mobile app available for download, which helps workers to find authorized fall prevention course provider.

Personal protective equipment

Hard hats, steel-toe boots and reflective safety vests are perhaps the most common personal protective equipment worn by construction workers around the world. A risk assessment may deem that other protective equipment is appropriate, such as gloves, goggles, or high-visibility clothing

Hazards and hazard controls for non-workers

Road construction sites are blocked off and traffic is redirected. The sites and vehicles are protected by signs and barricades. However, sometimes even these signs and barricades can be a hazard to vehicle traffic. For example, improperly designed barricades can cause cars that strike them to roll over or even be thrown into the air. Even a simple safety sign can penetrate the windshield or roof of a car if it strikes from certain angles. The majority of deaths in construction are caused by hazards relating to construction activity. However, many deaths are also caused by non construction activities, such as electrical hazards. A notable example of this occurred when Andy Roberts, a father of four, was killed in 1988 in New York while changing a light bulb at a construction site when he came into contact with a loose bare wire that was carrying two thousand volts of electricity and died. Events like this have motivated the passing of further safety laws relating to non construction activities such as electrical work laws.

TABLE 2 FATALITY OF WORKERS

NATION	FATALITIES/YEAR/1,00,000 WORKERS	YEAR
Australia	**6.20**	**2018**
Canada	**8.70**	**2008**
Europe	**99.0**	**2012**
France	**2.64**	**2012**
Finland	**5.90**	**2008**
Germany	**5.00**	**2008**
Ireland	**9.80**	**2013**
India	**10.0**	**2008**

Norway	**3.30**	**2008**
Sweden	**5.80**	**2008**
Switzerland	**4.20**	**2008**
UK	**1.62**	**2015**
USA	**9.80**	**2014**
Israel	**12.12**	**2015**

TABLE 3 CONSTRUCTION FATALITIES IN USA

YEAR	FATAL FALL	OTHER INJURIES	TOTAL
2017	**386**	**585**	**971**
2016	**384**	**607**	**991**
2015	**364**	**573**	**937**
2014	**359**	**540**	**899**
2013	**302**	**526**	**828**
2012	**290**	**516**	**806**

JOB SITE SAFETY ASSESSMENT

FIG.2 SITE SAFETY ASSESSMENT

If you have employees in California, you are required to complete a site safety assessment. This risk assessment is designed to identify and record any health and safety hazards that may exist at a workplace, along with corrective and protective measures A site safety assessment should be undertaken by those that are trained i2008n risk reduction and hazard assessments along with the control measures needed to keep workers safe in all places of employment. General public safety hazards must also be included in all safety assessments.

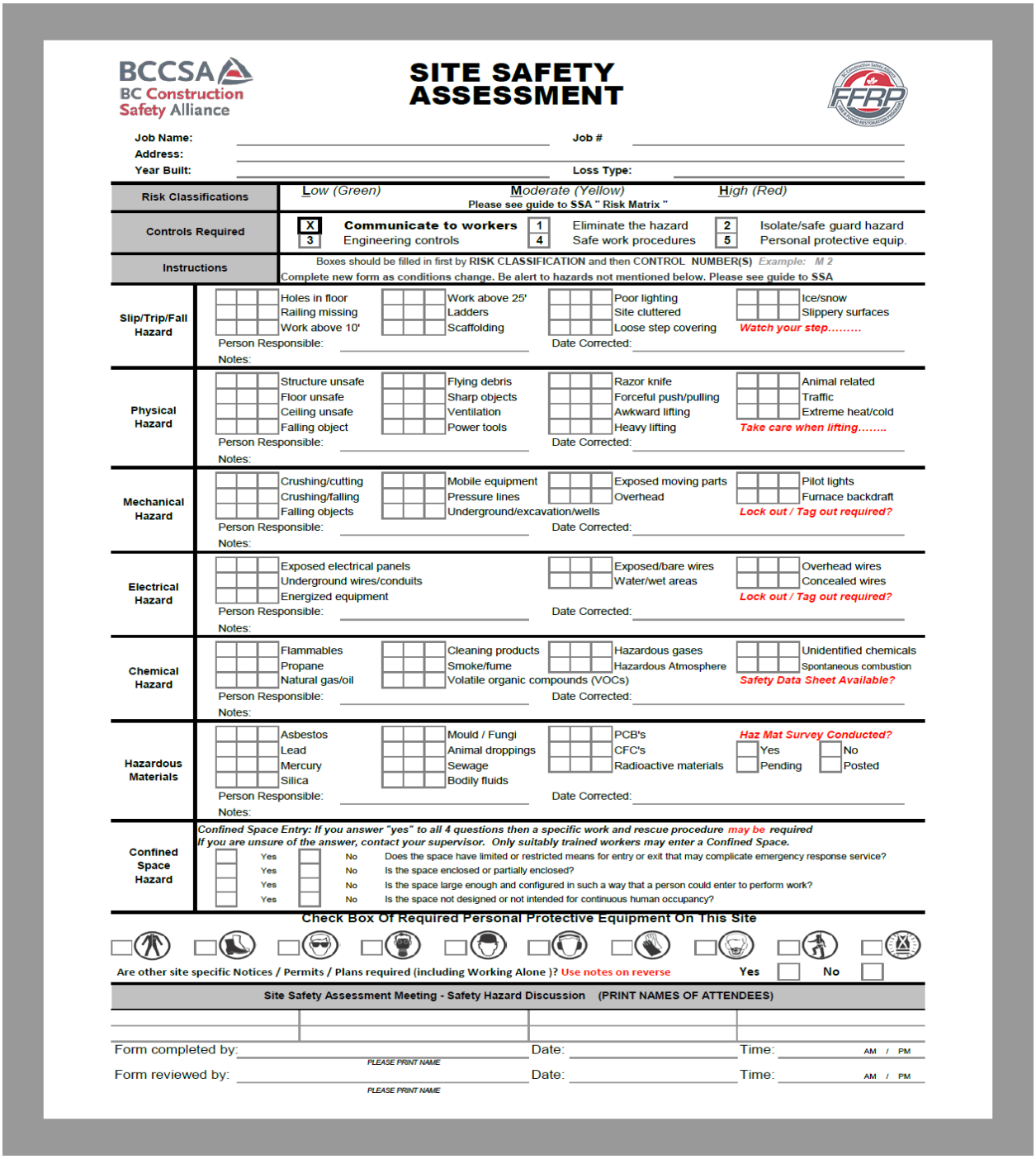
You'll be expected to identify all obvious hazards and to articulate, in writing and in action, how you plan to reduce the risk to workers through training, safe work plans, personal protective equipment and culture. Every workplace is unique, but the health and safety of workers and the general public is universal and risks must be controlled and/or eliminated. Site safety assessments should be completed daily in the form of a PRE-Shift Inspection, along with periodic hazard assessments.

Preventing Work Related Hazards

Avert disruptions with quality processes, procedures and training. It's a good assumption that if you have identified all obvious hazards, and protect workers from those hazards with detailed processes and procedures, coupled with the ongoing employee and manager training, you will be successful in reducing risk and injuries. From the proper use of personal protective equipment, to a clear and concise safety statement, you will deliver a clear mandate for workplace safety within your company. With a sound and well thought out plan, you won't experience the disruption of a worker related injury or illness, and the imposing Cal/OSHA investigation it may prompt. We have worked with hundreds of employers (and their Worker's Compensation insurance Carriers)

to ensure that their workers go home safe each day while the project progresses.

HAZARD ASSESSMENT CHECKLIST PDF document attached



BCCSA BC Construction Safety Alliance

SITE SAFETY ASSESSMENT

FFRP

Job Name: _____ Job #: _____

Address: _____

Year Built: _____ Loss Type: _____

Risk Classifications	Low (Green) — Moderate (Yellow) — High (Red). Please see guide to SSA " Risk Matrix "
Controls Required	[X] 3 Communicate to workers; [1] 4 Engineering controls; Eliminate the hazard; Safe work procedures; [2] 5 Isolate/safe guard hazard; Personal protective equip.
Instructions	Boxes should be filled in first by RISK CLASSIFICATION and then CONTROL NUMBER(S) *Example: M 2*. Complete new form as conditions change. Be alert to hazards not mentioned below. Please see guide to SSA

Slip/Trip/Fall Hazard

Holes in floor; Railing missing; Work above 10'; Work above 25'; Ladders; Scaffolding; Poor lighting; Site cluttered; Loose step covering; Ice/snow; Slippery surfaces

Watch your step.....

Person Responsible: _____ Date Corrected: _____

Notes:

Physical Hazard

Structure unsafe; Floor unsafe; Ceiling unsafe; Falling object; Flying debris; Sharp objects; Ventilation; Power tools; Razor knife; Forceful push/pulling; Awkward lifting; Heavy lifting; Animal related; Traffic; Extreme heat/cold

Take care when lifting.....

Person Responsible: _____ Date Corrected: _____

Notes:

Mechanical Hazard

Crushing/cutting; Crushing/falling; Falling objects; Mobile equipment; Pressure lines; Underground/excavation/wells; Exposed moving parts; Overhead; Pilot lights; Furnace backdraft

Lock out / Tag out required?

Person Responsible: _____ Date Corrected: _____

Notes:

Electrical Hazard

Exposed electrical panels; Underground wires/conduits; Energized equipment; Exposed/bare wires; Water/wet areas; Overhead wires; Concealed wires

Lock out / Tag out required?

Person Responsible: _____ Date Corrected: _____

Notes:

Chemical Hazard

Flammables; Propane; Natural gas/oil; Cleaning products; Smoke/fume; Volatile organic compounds (VOCs); Hazardous gases; Hazardous Atmosphere; Unidentified chemicals; Spontaneous combustion

Safety Data Sheet Available?

Person Responsible: _____ Date Corrected: _____

Notes:

Hazardous Materials

Asbestos; Lead; Mercury; Silica; Mould / Fungi; Animal droppings; Sewage; Bodily fluids; PCB's; CFC's; Radioactive materials

Haz Mat Survey Conducted? Yes; Pending; No; Posted

Person Responsible: _____ Date Corrected: _____

Notes:

Confined Space Hazard

Confined Space Entry: If you answer "yes" to all 4 questions then a specific work and rescue procedure may be required
If you are unsure of the answer, contact your supervisor. Only suitably trained workers may enter a Confined Space.

Yes / No	Does the space have limited or restricted means for entry or exit that may complicate emergency response service?	
Yes / No	Is the space enclosed or partially enclosed?	
Yes / No	Is the space large enough and configured in such a way that a person could enter to perform work?	
Yes / No	Is the space not designed or not intended for continuous human occupancy?	

Check Box Of Required Personal Protective Equipment On This Site

Are other site specific Notices / Permits / Plans required (including Working Alone)? Use notes on reverse — Yes [ ] No [ ]

Site Safety Assessment Meeting - Safety Hazard Discussion (PRINT NAMES OF ATTENDEES)

Form completed by: _____ Date: _____ Time: _____ AM / PM
PLEASE PRINT NAME

Form reviewed by: _____ Date: _____ Time: _____ AM / PM
PLEASE PRINT NAME

Why is a Site Safety Assessment important?

Every worker is entitled to a safe workplace!

The law states that a site safety assessment must be conducted prior to work commencing. Failure to comply with the law may result in injuries to workers. Site safety is important at each and every job, each and every day. As jobsite conditions change, it is critical to be aware that safety must be assessed on a continual basis.

Safety in the workplace saves lives - safety in the workplace is the law.

Site safety assessment is the first priority when you arrive at any worksite.
All people on site, not just those doing the actual work, must be made aware of any situation that could cause them physical harm

Before any work begins, a site safety assessment must be conducted by a trained person. The results of the safety assessment must be documented on the Site Safety Assessment (SSA) form.

The **SSA Form** helps the user to:

- **Identify** jobsite hazards.
- **Assess** the risks.
- **Classify** the hazards.
- **Record** the actions required.
- **Correct** each hazard by assigning responsibility.
- **Communicate** with all workers and visitors.
- **Document** your decisions and actions.

Using the SSA Form

- The SSA must be completed before any work starts.

- The purpose is to identify hazards.
- The SSA form will help remind you of what types of hazards or situations may be present

Hazard Classifications

One way to classify the hazard is to think about how likely it is that an injury may occur. People often use the terms hazard and risk interchangeably, but they are not the same.

Hazard means a thing or condition that may expose a person to a risk of injury or occupational disease.

Risk means a likelihood of injury or occupational disease.

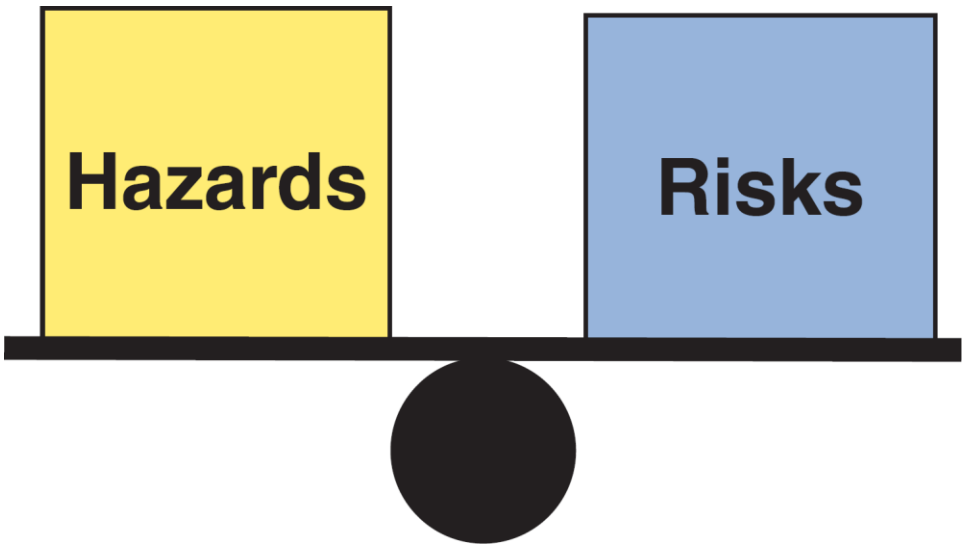


FIG.3 HAZARD AND RISK

Risk Assessment

Factors that influence the degree of risk include:

- The type of exposure, and

- The length of time of exposure to the hazard.

There are many ways to rank risks. The risk assessment grid shown here is the one used by FFRP training materials and will provide a consistent way to compare hazards and risk.

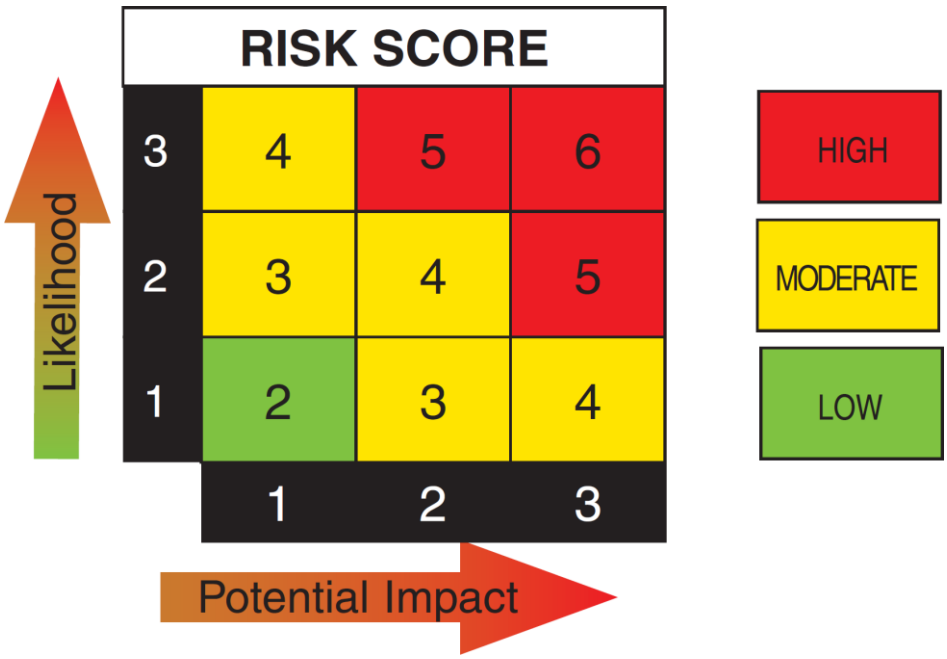


FIG.4 RISK SCORE

Controls Required

Always correct any hazardous situations you find. The **Controls Required** section on the SSA form lists the 5 most common ways to correct a situation. Once the control required is determined, it must be communicated to workers.

The controls are:

- Eliminate the hazard.
- Isolate / safeguard the hazard.
- Apply engineering controls.

- Develop safe work procedures.
- Use personal protective equipment (PPE).

The controls are ordered 1 to 5. Use these numbers on the SSA form to indicate what type of control you will use to correct the situation.

The numbers indicate the preferred choice for the type of action, with 1 being the best option.

This ranking is also known as the **hierarchy of control**.

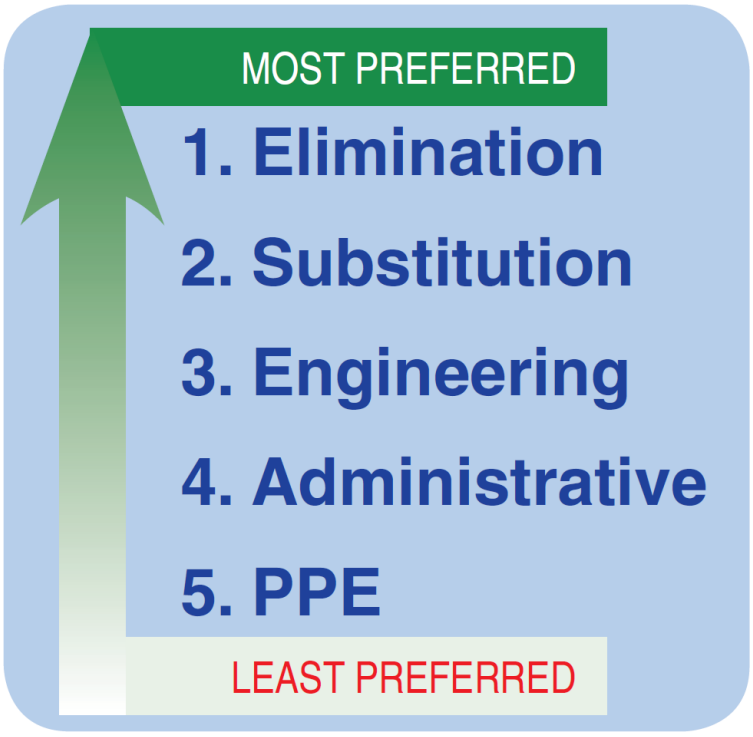


FIG.5 HIERARCHY OF CONTROL

Hierarchy of Control

Here are some examples of control steps you might take:

- **Elimination -** Rather than leaving power cords on the floor where people walk, run them along a wall or other out-of-the-way locations (therefore

eliminating the trip hazard); remove mould/sewage waste before other work occurs.

- **Isolate/safeguard hazard -** Use enclosures and shields to prevent the release of materials into the workplace and to prevent worker contact with the hazard.
- **Engineering controls -** Ventilation (using fans and air extraction systems to remove contaminated air), or minimize noise exposure by isolating noise sources.
- **Safe work procedures -** Use administrative controls to manage who, where, when, and how jobs are done. These controls can include training and signage.
- **Personal protective equipment (PPE) -** Workers are protected by wearing eye, face, ear, respiratory, hand or foot protection, or protective clothing (e.g. high visibility)

As you do your jobsite site safety assessment, you will use this checklist to help record the hazards you see.

- Slip / Trip / Fall Hazard
- Physical Hazard
- Mechanical Hazard
- Electrical Hazard
- Chemical Hazard
- Hazardous Materials
- Confined Space Hazard

Risk Classification Example

- In the first box, indicate the hazard classification. Indicate the risk by using **L for low**, **M for moderate** or **H for high**.

- Enter the name of the person who has been assigned to deal with a specific hazard, and the date that it was corrected.
- As you conduct your site inspection, pick the description that best fits the hazards you find.
- In the second box beside **exposed electrical panels**, indicate what you are going to take (actions 1 to 5 from the **Controls Required list (4)**

Common Jobsite Hazards

Slips, Trips and Falls.

Controls required could include:

- Tape or secure exposed power cords, cables, or other wires.
- Practice good housekeeping - keep floors clean and free of tripping hazards.
- Replace or repair damaged walking surfaces.
- Use sand, gravel, or other material for traction on snowy or icy surfaces.
- Post warning signs near wet, icy, or slippery surfaces.
- Use the **fall protection hierarchy** (WorkSafeBC website) when working at heights.

Physical hazards cover a wide range of situations. Common examples include:

- Heavy lifting
- Forceful pushing or pulling
- Injuries from being struck by mobile equipment
- Use of power tools
- Injuries from site clutter, collapsed or unsafe structures
- Sharp objects, edges or tools.

Mechanical Hazards

Include situations that involve:

- Mechanical or mobile equipment
- Situations where a person could be crushed or cut by moving machinery
- Missing machine guards that would prevent contact with rotating or moving parts. (DO NOT remove or bypass guards!)
- Presence of pressure lines
- Working in underground situations such as excavations or wells

Electrical Hazards

The electrical hazards category includes exposed panels or wires, overhead or underground wires, or the presence of water.

Be sure you know how to work safely near electricity.

- Pay attention to spills and wet areas around electrical equipment and power lines.
- Have damaged electrical equipment repaired.
- Before using electrical equipment, check that power cords and switches are working properly.
- Be especially careful when working in electrical rooms or near electrical panels.
- When working outdoors, inspect the area thoroughly for overhead power lines. Ensure work procedures will not bring you or co-workers in close proximity.

Chemical Hazards

The electrical hazards category includes exposed panels or wires, overhead or underground wires, or the presence of water.

Be sure you know how to work safely near electricity.

- Chemicals can be present as solids, liquids or gases.
- Chemicals can have many hazards - they can be toxic, flammable, corrosive, reactive, etc.
- To help you use these products safely, use the information on the product labels and material safety data sheets (SDSs).
- If you find chemical hazards, or if you find a chemical but you don't know what it is, be sure to investigate and find the safe work practices you need to follow.

Hazardous Materials

Hazards in this category cause illness or infectious disease from exposure to hazardous substances such as viruses, bacteria, or moulds (fungi).

Some examples include:

- Asbestos
- Lead
- Mercury
- Silica
- Mould / Fungi
- Animal droppings
- Sewage
- Bodily fluids

- PCB's
- CFC's
- Radioactive materials

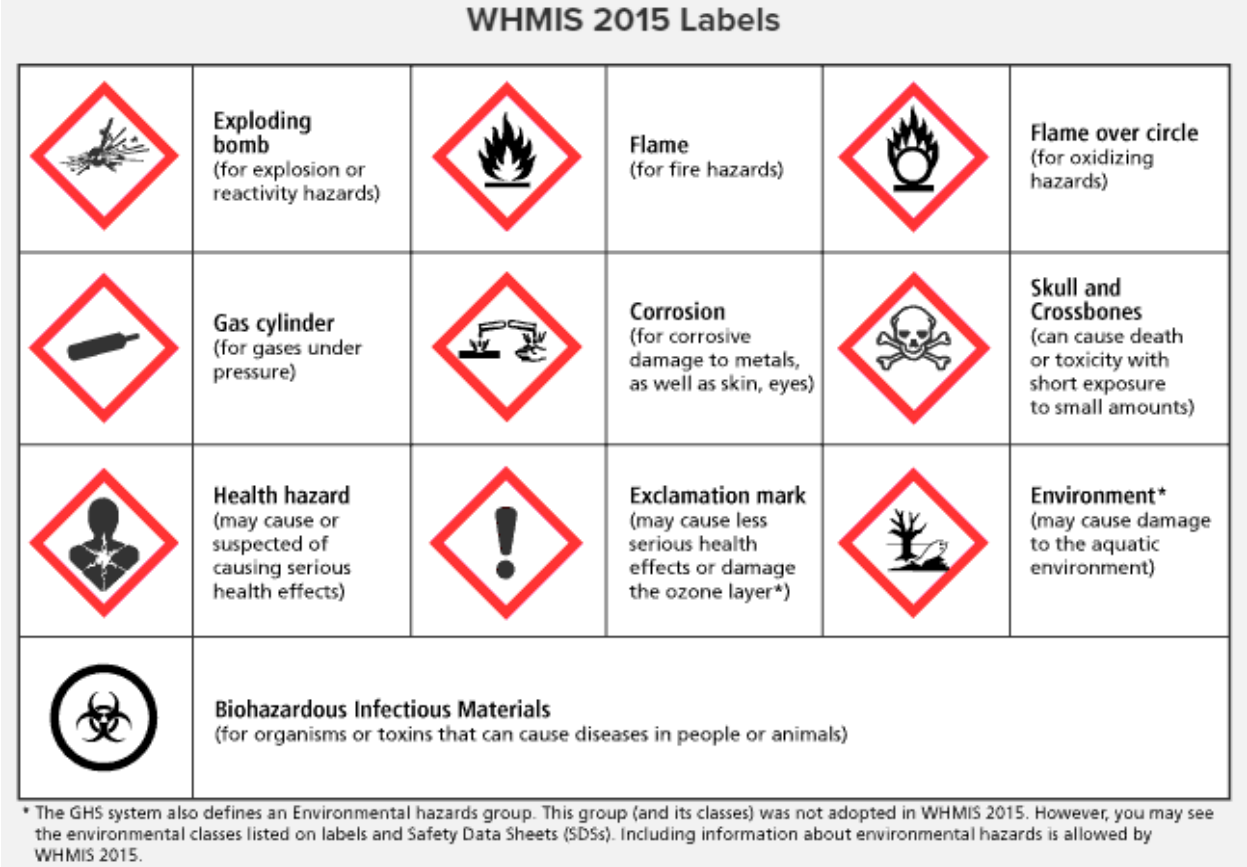


FIG.6 WHMIS 2015

FIG.7 CONSUMER LABELS

Personal Protective Equipment (PPE)

For PPE, depending on the project, you would put a check in any or all boxes to indicate which PPE is required. In some cases, specialized PPE may be required (e.g. fall restraint).

Personal Protective Equipment

For more information on a particular topic, click on the document title below:

- Body Belts, Harnesses, and Lanyards
- Chemical Protective Clothing - Glove Selection
- Designing an Effective PPE Program
- Eye and Face Protectors
- Fall Protection - Travel Restraint System
- Foot Comfort and Safety at Work
- Footwear - Assessment Checklist
- Headwear, Care of
- Hearing Protectors
- High-Visibility Safety Apparel
- Personal Protective Clothing - Trade Names, Manufacturers
- Protection Against Drowning
- Respirators - Respirator Care
- Respirators - Respirator Selection
- Respirators - Respirators Versus Surgical Masks
- Respirators - Wearing a Respirator
- Safety Footwear

JOBSITE SAFETY MEETINGS

Due diligence requires that a safety meeting be held before the start of each work shift, or as conditions change.

At the bottom of the Site Safety Assessment form, you will find a section which will allow you to record the names of the people who attended your onsite meeting. All workers and visitors are required to sign the form, indicating that they have reviewed and understood the SSA form. Record the date and time of the meeting.

Topics for Jobsite Safety Meetings

The jobsite safety meeting should cover:

- A review of the completed SSA form
- Addressing all questions
- The steps taken to remediate the hazards
- Any PPE requirements
- Any other notices, permits, and plans required.

Sample Construction Safety Meeting Agenda Template

PDF available

SAFETY INCENTIVES

ppt video https://slideplayer.com/slide/8593021/

What are safety incentive programs?

A **Safety Incentive Program** is a reward system that encourages workers to report injuries, illnesses, near misses, or hazards; while also encouraging their

involvement in the company's **safety** and health management **program**, by offering rewards and/or recognition.

What are the 3 types of incentives?

Let's Take a Step Back… In the mega best-seller "Freakonomics," Levitt and Dubner said "there are **three** basic flavors of **incentive**: economic, social, and moral. Very often a single **incentive** scheme will include all **three** varieties

Designing a safety incentive program

According to a 2010 survey conducted by the Government Accountability Office, 116,000 of about 153,000 manufacturers in the United States (75 percent) had safety incentive programs that may affect workers' reporting of injuries and illnesses. Not a good statistic.

The survey was driven by an OSHA concern that safety incentive programs may encourage non-reporting. After all the discussion and analysis, OSHA issued a memo confirming that, when done right, the agency supports safety incentive programs. It is how they are designed that matters.

From the OSHA memo: "A positive (safety) incentive program encourages or rewards workers for reporting injuries, illnesses, near-misses, or hazards; and/or recognizes, rewards, and thereby encourages worker involvement in the safety and health management system. Such an incentive program can be a good thing and an acceptable part of a (VPP) quality safety and health system." That being said, OSHA inspectors, senior executives and financial people are examining what safety measures employers choose to focus on in their safety incentive program. What gets measured differs from company to company and industry to

industry, but the golden rule has been set for all employee safety incentive programs: “Thou shall not appear to encourage/promote non-reporting.”

Regardless of the measures used, employers need to understand that an organization’s safety climate will be tied to a balanced safety incentive program. How can you create a positive, OSHA-friendly employee safety incentive program that will be a balanced part of your overall safety and health management system?

- Don’t limit yourself to what you have done in the past. You need to be keeping your eyes on the future. Where are expectations in safety heading? What new trends are emerging in your industry related to safety? What technology is available that will help? Can you leverage what you currently do and move forward, or do you need a fresh start?
- Create categories: As you can see from the following examples, to achieve a balanced employee safety incentive program, you must measure and recognize leading/upstream indicators, as well as acknowledge lagging indicators.

Category I: Safe work

Examples would include, but are not limited to, participation in a safety meeting, supervision-recognized safe act, zero incidents for the month, perfect attendance, etc.

Category II: Proactive safety

Examples would include, but are not limited to, reporting a near miss, reporting unsafe conditions, participating in stretch exercises, participating in a safety audit, good housekeeping, and completing safety training.

Category III: Safety leadership

Examples would include, but are not limited to, leading a safety meeting, participating in a root cause investigation, leading stretch exercises, and recognizing a peer for a safe act.

Category IV: Safety engagement

Examples would include, but are not limited to, on-the-spot safe act, above and beyond safe behavior, being a safety team player, and off-the-job safety ideas.

In the end, a balanced safety incentive program will measure and recognize your people for safety engagement on and off the job and will, if properly structured, raise safety awareness, reduce incidents and increase the bottom line – all without encouraging non-reporting of incidents.

How has technology changed or improved the way employee safety incentive programs are managed and executed?

In our experience, safety professionals lack a strong safety incentive program within their safety and health management system because of limited time, limited expertise and, with staff cutbacks, limited resources to properly administer an effective solution.

Another reason is that safety professionals struggle with buy-in from upper management, especially at the C-level.

What today's top-performing safety incentive programs have in common is proper and effective leveraging of technology that makes for much easier administration and a continuously evolving event/behavior-based approach that can be measured in real time, delivering executive reports that tie back to the incentive program's strategic goals and objectives.

Below are two areas in which technology can improve how safety incentive programs are managed and executed.

Ease of administration

Safety professionals ask, “How much time is needed to support the program?”

Web-based management systems have proven to be time-savers in areas of organizations during the past decade. Recently, we have seen many organizations – large and small – deploy software or technology developed by leading safety incentive program vendors that reduces the time involved in handling data required for an incentive program.

Often, you have “processes” in place to measure, but the time-consuming administrative tasks to upload the data to implement an effective safety incentive program made it impossible without adding staff. You needed the tools to do it faster, more efficiently and more effectively. Those tools are now available. Features of this new technology include:

- An end-to-end system that reduces costs and workflow
- Around-the-clock access by program administrators and participating employees
- No IT barriers
- Specifically designed for safety and related functions
- Seamless integration with other technology used for training, tracking observations, etc.

Strategic executive reporting

Justifying a safety incentive budget is difficult when asked, “What’s happening with the safety incentive program?”

As safety incentive programs evolve from reactive to proactive, organizations are using the data and reports from their programs to communicate safety culture change to the executive level.

A steady stream of up-to-date information can be had in real time. For example, if one goal was to support a culture of early reporting, events that could be measured include reporting of near misses and unsafe behaviors observed as a way to earn incentive awards. These events can easily be tracked in most incentive software. A points-based system adds several dimensions to a program, including the opportunity to "bank" points and store them for larger awards. Benefits of this new technology include:

- Higher level of participation and buy-in
- Improved communications
- Accurate and real-time reporting
- Right information to the right people
- A unified strategy

With safety increasingly becoming a competitive business metric, there are many reasons to look at how technology can help safety professionals manage and execute effective safety incentive programs that OSHA has described as positive and "encourages or rewards workers for reporting injuries, illnesses, near-misses, or hazards; and/or recognizes, rewards, and thereby encourages worker involvement in the safety and health management system."

OWNERS RESPONSIBILITY FOR SAFETY

The Role of Project Owners in Promoting Safety On & Around Construction Sites - Expert Article

In this article, architect & construction expert, Will Martin discusses the project owner's role in promoting safety on and around the construction site. Our experts are frequently retained to investigate injuries to construction workers and the general public to explain the responsibilities and liability of the various parties

THE ROLE OF PROJECT OWNERS IN PROMOTING SAFETY ON & AROUND CONSTRUCTION SITES

Owners of construction projects can rely upon contractors to shoulder the burden of construction safety, but only up to a point. Project owners must consider safety both on the site and adjacent to the site as part of planning a construction project and throughout the contracting process. Owners must provide direction and information necessary for a contractor to produce and enforce an effective safety plan, and they must consider safety when evaluating prospective contractors.

CONTRACTOR RESPONSIBILITY

The contractor's responsibility for construction site safety is well established and non-delegable. The general contractor is required to have a jobsite safety plan that conforms to OSHA and local requirements. On certain federal projects the contractor must conform to the U. S. Army Corps of Engineers' safety requirements. The American National Standards Institute publishes ANSI A10.34 Protection of the Public on or Adjacent to Construction Sites. This standard, along with the Corps of Engineers publication EM 385-1-1 Safety and Health Requirements Manual, specifically tasks the contractor with expanding the safety plan to include consideration of adjacent areas that could be affected

by construction operations. When vehicular traffic and circulation are affected by construction, Chapter 6 of the Manual for Uniform Traffic Control Devices (MUTCD) provides standardized requirements for temporary signage, barricades, and other temporary safety controls.

OWNER RESPONSIBILITY

The owner or operator who hired the contractor cannot completely avoid responsibility for safety by hiring a contractor. ANSI A10.1 Pre-Project & Pre-Task Safety and Health Planning outlines the project owner's responsibilities. The owner's responsibilities apply during the planning and design phases, long before bidding or contractor selection. The project specifications should make safety expectations clear, and prospective contractors should be given sufficient time and information to analyze and incorporate safety requirements into final pricing. Prospective contractors' safety histories should be evaluated by the owner through inspection of safety records, workers compensation modifier rates, and the credentials of contractor personnel responsible for site safety. Specifications should require site specific safety plans. Many projects have shared equipment like forklifts and scaffolds. The specification should require a single party, whether the general contractor or some other specified entity, to retain full responsibility for shared equipment. This counteracts the tendency for "everyone's job" to become no one's job. Safety responsibility during construction falls within two basic categories – within the project site and adjacent to the project site.

OWNER RESPONSIBILITY ON-SITE

The project owner must disclose known hazards to the designers and contractor prior to the start of work. The owner must produce a "Good Faith Letter" outlining where hazardous materials are and whether they have been abated

prior to the start of work on an older building. The owner should require the contractor to produce and follow a site-specific safety plan. Safety review has become a standard part of weekly owner-contractor progress meetings. Owners should emphasize safety requirements and expectations during these weekly meetings.

OWNER RESPONSIBILITY ADJACENT THE SITE

The owner's responsibility for safety adjacent to a construction site is more complex. For example, if an owner undertakes a remodel or expansion in an occupied facility, that owner must ensure that the construction area is reliably barricaded, fenced, or otherwise made inaccessible to people who don't belong there. Sometimes security guards are necessary to prevent unauthorized personnel finding ways to defeat fences and barricades. Ongoing work in the facility but outside the construction fence, like alterations to mechanical or electrical systems, can entail tools and equipment in areas also occupied by non-construction people. The owner must coordinate safety efforts with the contractor in order to minimize the likelihood that a curious person will enter a construction area or get injured by ongoing construction in an area outside the construction enclosure.

Another owner / contractor safety coordination is scheduling potentially hazardous work at a time that minimizes the number of non-construction people in the area when it is in progress. As an example, if a facility is being expanded using tilt-up concrete walls, any areas that could be affected in the event of a miscue should be vacated during the tilt-up. Once the structure is safely erected and reliably stabilized, the owner may put those areas back into normal operation.

The owner remains responsible for housekeeping around the construction site. Construction is a noisy, dusty process that can cause vibrations and other

disruptions. That noise, dust, and vibration should be kept as contained as possible, but it's not always possible to achieve complete containment. The owner must consider the effect upon sensitive operations or materials that could become unstable due to vibration and perform routine inspections to prevent hazards.

CONCLUSION

A project owner can look to a properly licensed and insured contractor to shoulder the bulk of responsibility for construction jobsite safety. Making sure the contractor has a valid license and appropriate insurance, and then allowing the contractor to work independently puts responsibility upon the contractor. But, the project owner cannot avoid all responsibility. The owner must plan for safety from project conception. The owner must provide the contractor with information necessary to provide a safe worksite. The owner must coordinate with the contractor to schedule work safely, and the owner must perform inspections to discover and correct any safety problems that construction operations may cause in areas adjacent to the jobsite. Construction safety requires analysis, planning, and ongoing vigilance by all involved parties. Although the issues grow more extensive and more complex as the size and complexity of the project increases, the requirements remain fundamentally the same whether the project is a residential bathroom remodel or a large industrial, commercial, or institutional project

ROLE OF DESIGNER FOR ENSURING SAFETY

What are the roles and responsibilities of a designer?

Graphic Designer Job Responsibilities:

- Prepares work to be accomplished by gathering information and materials.

- Plans concept by studying information and materials.
- Illustrates concept by **designing** rough layout of art and copy regarding arrangement, size, type size and style, and related aesthetic concepts.

As a **designer** you must **ensure** that the project is capable of being constructed to be **safe**, can be maintained safely and complies with all relevant **safety** and health legislation. You must: Identify any hazards that my design may present during construction and subsequent maintenance.

Designers: roles and responsibilities

Construction (Design and Management) Regulations 2015 (CDM 2015)

A designer is an organisation or individual whose business involves preparing or modifying designs for construction projects, or arranging for, or instructing, others to do this. Designs include drawings, design details, specifications, bills of quantity and design calculations. Designers can be architects, consulting engineers, quantity surveyors and interior designers, or anyone who specifies and alters designs as part of their work. They can also be principal contractors, specialist contractors, trades people or even commercial clients, if they get actively involved in design work for their project. A designer's decisions can affect the health and safety of all those involved in constructing a building and those who use, maintain, refurbish and eventually demolish it.

Designers must:

- make sure the client is aware of the client duties under CDM 2015 before starting any design work
- when preparing or modifying designs:
  - take account of any pre-construction information provided by the client (and principal designer, if one is involved)

- eliminate foreseeable health and safety risks to anyone affected by the project (if possible)
- take steps to reduce or control any risks that cannot be eliminated

- provide design information to:
  - the principal designer (if involved), for inclusion in the pre-construction information and the health and safety file
  - the client and principal contractor (or the contractor for single contractor projects) to help them comply with their duties, such as ensuring a construction phase plan (PDF)- Portable Document Format is prepared
- communicate, cooperate and coordinate with:
  - any other designers (including the principal designer) so that all designs are compatible and ensure health and safety, both during the project and beyond
  - all contractors (including the principal contractor), to take account of their knowledge and experience of building designs

Working as a designer for a domestic client is no different to working for a commercial client. However, the domestic client's legal duties are normally taken on by the contractor (or the principal contractor on projects involving more than one contractor) and the designer must work to them as 'client' under CDM 2015. Alternatively, the domestic client can ask the principal designer to take on the client duties, although this must be confirmed in a written agreement. Where the project involves more than one contractor and the domestic client does not appoint a principal designer, the role of the principal designer must be carried out by the designer in control of the pre-construction phase. Designers' Role in Construction Safety Management in Design Stage

It is necessary for the whole project stakeholders to improve the level of construction safety management, which includes the owner, designer, contractor, construction supervisor, government regulators and other parties.

With respect to the research about construction project safety, existing literatures mainly consider about contractor, construction supervisor and other parties. However, Design stage is the key point of affecting the construction safety management and more attention should be paid. Design stage provides the basis to control the project safety risks in construction stage. Aiming to give better play for designers in construction safety management, this paper probed project safety management system, suggested the approach of designer roles in construction project safety management, analyzed the challenges if designer took part in construction safety management, and gave some countermeasures on how to take advantage of the designer in improving the level of construction safety.

Duties as a Designer

As a designer you must ensure that the project is capable of being constructed to be safe, can be maintained safely and complies with all relevant safety and health legislation.

You must:

- Identify any hazards that my design may present during construction and subsequent maintenance
- Where possible, eliminate the hazards or reduce risk

FIG.6 HAZARD PREVENTION

Where there are residual risks, you must

- Communicate necessary control measures
- Design assumptions or remaining risks to the Project Supervisor Design Process (PSDP) so that they can be dealt with in the Safety and Health Plan
- Co-operate with other designers and the Project Supervisor Design Process (PSDP) or Project Supervisor Construction Stage (PSCS)
- Take account of any existing safety and health plan or safety file
- Comply with directions issued by the PSDP or PSCS
- Where no PSDP has been appointed, inform the client that a PSDP must be appointed.

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DEPARTMENT OF CIVIL ENGINEERING

UNIT V - CONTRACTUAL OBLIGATIONS - SCI 1614

Safety in Construction Contracts – Substance Abuse – Safety Record Keeping - Hazard identifications and control techniques - HAZOP, FMEA, FMECA - Cost of Construction Injuries - Legal Implications Compensation - basics and types.

SAFETY IN CONSTRUCTION CONTRACTS

The contractor is responsible for **safety** at the **construction** or work site. The contractor is also responsible for preparation of a **safety** plan and for carrying out the **safety** plan. The contractor staff shall maintain conformance to the health and **safety** plan throughout the course of **construction.**

SAFETY RECORD KEEPING

One often-overlooked area is a thorough **safety** documentation and **recordkeeping** program. A **safety recordkeeping** program will help you set goals, measure progress, pinpoint areas needing attention, and identify areas that were successful in preventing work-related injuries and illnesses.

What is a safety record?
A **safety record** is any information, which can be used to support a **safety** claim and demonstrate the degree of acceptability of the **safety** performance of the services provided by an organization.

What are the methods of record keeping?
Methods for Good Record Keeping

- Reconcile bank accounts, **credit cards** and **Paypal**. On a monthly basis, you should reconcile your business bank accounts using your bank statements.
- Track true revenue less fees, not net amount.
- Avoid using **cash** for business purchases.
- Find a bookkeeping software (Quick books, Wave, etc.)
- Set aside money for taxes.

What is health and safety documentation?
A **health and safety** policy documents how you will manage **health and safety** in your business. It should clearly state who does what, how and when. If you have fewer than five employees you don't have to write it down. We can tailor a **health and safety** policy specifically for your business

What are the benefits of record keeping?

- Monitor the progress of the business.
- Prepare the financial statements.
- Identify sources of the **income**.
- Keep track of the deductible expenses.
- Keep track of the property.
- Prepare the tax returns.
- Support items reported on the tax returns

What type of safety record-keeping and recording should we be doing?

The question of which type of safety records to keep and the best ways to record them is an important one, and the answer is more complex than you might think.

MINIMUM STANDARDS

Occupational Safety and Health Standards **(**OSHA) mandates certain minimum record-keeping and reporting standards that apply to most corporations in America. The only companies that are exempt from these requirements are those with fewer than 10 employees or those operating in low injury-risk industries. Companies that are bound by OSHA requirements are required to track incidences of injury and illness that occur in the workplace and they must detail these workplace incidents in a published report each year. In addition to this requirement, companies must inform OSHA within eight hours of a workplace fatality and within 24 hours of a severe accident (meaning an accident that results in an amputation or a loss of an eye). This quick reporting allows OSHA to dispatch investigators as needed.

Going Deeper

These federal standards represent a good starting point for record-keeping and reporting. However, some companies – particularly publicly traded companies – may want to go further in recording and reporting events in order to cultivate a positive public image as a company that cares deeply about the health and well-being of its employees. An increasing number of investors, moreover, consider firms' occupational health and safety records when making buying and selling decisions. A poor track record in this area may depress corporate valuation, leading to real economic losses for the company (find out how to avoid this in How to Look After Your Business' Safety Reputation). Therefore, it may be imperative for companies not only to report accidents, but also initiatives that they have launched to address safety challenges in their business in order to give a big picture view of their commitment to improved safety outcomes.

COMPARE WITHIN INDUSTRIES

The volume of reporting and the expectations for what these reports will contain may vary significantly across industries. For example, a metals and mining company are likely to have far more adverse events, as well as accompanying initiatives to report, than a bookstore. So, it is important for investors and others to compare track records and reporting within industries, guaranteeing an apples-to-apples perspective. Cross-industry comparisons may be badly distorted (these comparisons can also help you motivate safety buy-in from management – find out how in Get Your CEO to Support Safety with the Curve Approach).

Get Quality Consulting

Qualified consulting companies, as well as lawyers specializing in workplace safety and employer liability, can and should review a firm's record-keeping and reporting to ensure that the firm is, at a minimum, meeting all legal reporting requirements. These advisors can then offer comprehensive recommendations on upgrading procedures and policies. For example, they may provide important advice on how and why to carefully track and analyze near misses as a way to upgrade health and safety efforts (learn more in Near Misses: What They Are and Why You Should Report Them

Understanding—and Fulfilling—Your Safety Recordkeeping and Reporting Obligations

Employer recordkeeping and reporting requirements appear throughout the Occupational Safety and Health Administration's (OSHA) workplace safety and health regulations. Depending on the nature of your business, not all apply to your company and your employees.

AnemStyle / Shutterstock.com

However, nearly all U.S. employers are required to complete three OSHA forms:

- Form 300, the Log of Work-Related Injuries and Illnesses;
- Form 301, an Injury and Illness Incident Report, which must be completed whenever there is a work-related injury or illness at a facility; and
- Form 300A, the Summary of Work-Related Injuries and Illnesses, which must be filed annually with federal or state agencies.

The forms must be retained for 5 years and provided to OSHA enforcement personnel whenever the agency inspects a workplace or investigates an accident, injury, or illness. There are a few exemptions from the recordkeeping requirements. Some employers are exempt due to size. Some employers—like attorneys' offices, churches, and jewelry stores—are exempt due to industry classification unless OSHA, the Bureau of Labor Statistics, or a state agency asks the employer to complete and maintain injury and illness records.

All employers required to keep injury and illness records must complete and post the previous year's Form 300A Summary in the workplace from February 1 to April 30 each year. However, establishments that had 250 or more employees at any point during the previous calendar year must also submit the Form 300A to OSHA electronically by March 2 each year. Establishments in certain high-hazard industries that had 20 to 249 employees during the previous calendar year must also submit the Form 300A electronically. The industries are listed in the appendix to OSHA's electronic submission regulation and include a broad range of sectors, such as agriculture, construction, manufacturing, services, transportation, and utilities.

OSHA defines a "recordable injury or illness" as:

- Any work-related injury or illness requiring medical treatment beyond first aid;
- Any work-related injury or illness resulting in a loss of consciousness, days away from work, restricted work, or transfer to another job;
- Any work-related fatality; and
- Any work-related diagnosed case of cancer, chronic irreversible diseases, fractured or cracked bones or teeth, and punctured eardrums.

There also are special recording criteria for work-related cases involving hearing loss, medical removal, needlesticks and sharps injuries, and tuberculosis. The log of work-related injuries and illnesses requires entries for the employee name and job title, date of the injury or disease onset, where the event occurred, description of the injury or illness or body part affected, and number of days away from work or on restricted duty or a transfer to another job. Cases also must be classified by death or whether the employee remained on the job or had to spend time away from work. The Form 300 log also contains check boxes for hearing loss, injury, poisoning, respiratory condition, skin condition, or other illness.

The Form 301 report for each injury or illness requires greater detail. Questions on the report form include:

- What was the employee doing just before the incident occurred?

- What happened?
- What was the injury or illness?
- What object or substance directly harmed the employee?
- If the employee died, when did death occur?

The employer also must record details such as when the employee was hired, when the employee began work the day of the injury or illness, and when the injury or illness occurred. The report also must include treatment information collected from a physician or other health professional. The Form 300A Summary collects information compiled from entries on the OSHA 300 log. You must report the numbers of cases, days away from work or on job transfer or restricted duty, and types of injuries and illnesses. The summary also must include your Standard Industrial Classification (SIC) or North American Industry Classification System (NAICS), if known.

You can find downloadable versions of the forms on OSHA's website. OSHA provides copies of the forms as Adobe Acrobat Portable Document Format (PDF) files for printing and Microsoft Excel templates that can be customized and exported to other applications. Employers also must immediately report amputations, fatalities, and severe injuries. All work-related fatalities must be reported to OSHA within 8 hours, and all amputations, inpatient hospitalizations, and losses of an eye must be reported within 24 hours.

OSHA will not hesitate to cite and penalize you for failing to report these. There also are scores of other recordkeeping requirements in other regulations. However, these other recordkeeping requirements are triggered only by the presence of a particular hazard. Some OSHA standards require written compliance programs. Others require detailed exposure monitoring and medical surveillance records.

2016 Electronic Filing Rule

A May 12, 2016, rulemaking would have required employers to electronically file data from their OSHA Form 300 logs and Form 301 reports once a year, as well as their Form 300A summary data. The first submission deadline was July 1, 2017, for Form 300A data from 2016; but the deadline was extended to December 15, 2017. The first submission deadline for Form 300 and 301 data was July 1, 2018. The agency never enforced the submission requirement for Forms 300 and 301 and removed it January 25, 2019. OSHA never received any submissions of Form 300 and 301 data that would have been required by the May 12, 2016, rulemaking.

Obama administration officials had planned to disclose establishment-specific injury and illness data on OSHA's website while concealing personal worker

information. The rule was designed to "nudge" employers to better protect their employees, then OSHA Administrator David Michaels said at the time. The Agency compared the planned public disclosure of employers' injury and illness data to the reports of unsanitary conditions at food establishments released by local public health departments. OSHA later argued in its rescission of the more extensive submission requirements that the Agency might be forced by court order to disclose personal worker information and that the collection of such information could motivate cyber attacks on agency data systems to steal workers' personal information.

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Electronic Submission Resolved?

Is the issue of an electronic filing requirement for OSHA Form 300 logs and Form 301 reports finally resolved? The Agency rescinded the electronic filing requirements out of a stated concern for worker privacy, retaining only the requirement for submission of 300A summary data. OSHA did not fully address its earlier goal of attempting to shape employer behavior by public disclosure of injury and illness data. However, the Agency cautioned in its January 25, 2019, rulemaking that records of past injuries and illnesses do not accurately reflect current workplace hazards or a pattern of noncompliance.

The rescinding of the Form 300 and 301 electronic filing requirements prompted a number of responses. Public advocacy groups and several states filed federal suits that have gone nowhere, alleging OSHA failed to provide a full justification for removing the electronic filing requirements. California passed a law ordering the Division of Occupational Safety and Health (Cal/OSHA) to determine whether the Agency should take any action to fulfill the goals of the original federal rulemaking. Cal/OSHA accepted written comments and held a public advisory committee meeting on May 9, 2019. Cal/OSHA so far has not moved forward with a rulemaking for electronic submission requirements for injury and illness logs and reports. The state Agency also has not closed the matter.

The issue of electronic filing requirements is by no means settled. Supporters of the requirements are not going away. Labor union officials called the Trump administration's privacy concerns "disingenuous," and labor union support for the rescinded rule is at least as strong as industry opposition to the Obama administration's original rulemaking. A change in administration could see it revived.

Because OSHA lacks the personnel to inspect all U.S. workplaces, labor unions and other safety advocates continually look for ways to affect employer

behavior. For example, Sen. Bernie Sanders (I-VT), Rep. Ilhan Omar (D-MN), and others have called for the disclosure of injury and illness records for Amazon's distribution warehouses.

Other Recordkeeping Requirements

Some employers must keep records besides the injury and illness logs, incident reports, and annual summaries. Recordkeeping requirements for other OSHA standards include:

- Exposure measurements, medical surveillance, and training records for dozens of standards covering workplace exposures to hazardous and toxic substances, such as asbestos, hexavalent chromium, and lead;
- Air quality testing in underground construction;
- Confined space entry permits;
- Crane operator training;
- Fall protection plans and practices;
- Medical evaluation and respirator fit testing under the respiratory protection standard;
- Inspection, testing, and training performed in compliance with the standard for process safety management of highly hazardous chemicals;
- Medical surveillance and training required by the hazardous waste operations and emergency response (HAZWOPER) standard;
- A Hazard Communication (HAZCOM) program and safety data sheets for all hazardous chemicals used or stored at a facility;
- Exposure monitoring and audiometric testing records for occupational noise exposure;
- Inspection and maintenance records for fire suppression systems;
- Inspection and load-testing records for overhead and gantry cranes and crawler locomotive and truck cranes;
- Inspection and maintenance, operator training, and safety system certification records for mechanical power presses, as well as inspection and maintenance records for forging machines;
- Inspection, maintenance, testing, and training records for powered platforms; and
- Inventory records for explosives and blasting agents.

Dates to Remember

Your paperwork burden will almost certainly include injury and illness recordkeeping. Depending on the hazards present in the workplace posed by equipment and machinery, hazardous substances, or occupational noise, you may have to keep scores of other records for compliance programs, exposure

monitoring, and medical surveillance. Injury and illness logs and reports must be kept current. A summary of injuries and illnesses must be posted annually in the workplace and submitted to OSHA or your state occupational safety and health agency. Fatalities and severe injuries must be reported immediately.

OSHA often cites and sometime penalizes employers for recordkeeping violations in addition to whatever other safety and health violations agency inspectors find during an inspection or accident investigation.

Keep in mind that:

- The OSHA Form 300A Summary of Work-Related Injuries and Illnesses for the previous calendar year must be posted from February 1 to April 30 each year;
- OSHA Form 300A must be submitted electronically by March 2;
- Form 300 logs and Form 301 reports must be retained for 5 years following the calendar year and made available to OSHA enforcement personnel during a workplace inspection or investigation;
- All work-related fatalities must be reported to OSHA within 8 hours; and
- All inpatient hospitalizations, amputations, and losses of an eye must be reported within 24 hours

Hazard identifications and control techniques

Hazard Identification and Assessment

One of the "root causes" of workplace injuries, illnesses, and incidents is the failure to identify or recognize hazards that are present, or that could have been anticipated. A critical element of any effective safety and health program is a proactive, ongoing process to identify and assess such hazards.

To identify and assess hazards, employers and workers:

- Collect and review information about the hazards present or likely to be present in the workplace.
- Conduct initial and periodic workplace inspections of the workplace to identify new or recurring hazards.
- Investigate injuries, illnesses, incidents, and close calls/near misses to determine the underlying hazards, their causes, and safety and health program shortcomings.
- Group similar incidents and identify trends in injuries, illnesses, and hazards reported.

- Consider hazards associated with emergency or nonroutine situations.
- Determine the severity and likelihood of incidents that could result for each hazard identified, and use this information to prioritize corrective actions.

Some hazards, such as housekeeping and tripping hazards, can and should be fixed as they are found. Fixing hazards on the spot emphasizes the importance of safety and health and takes advantage of a safety leadership opportunity. To learn more about fixing other hazards identified using the processes described here, see "Hazard Prevention and Control."

Action item 1: Collect existing information about workplace hazards

Action item 2: Inspect the workplace for safety hazards

Action item 3: Identify health hazards

Action item 4: Conduct incident investigations

Action item 5: Identify hazards associated with emergency and nonroutine situations

Action item 6: Characterize the nature of identified hazards, identify interim control measures, and prioritize the hazards for control

Action item 1: Collect existing information about workplace hazards

Information on workplace hazards may already be available to employers and workers, from both internal and external sources.

How to accomplish it

Collect, organize, and review information with workers to determine what types of hazards may be present and which workers may be exposed or potentially exposed. Information available in the workplace may include:

- Equipment and machinery operating manuals.
- Safety Data Sheets (SDS) provided by chemical manufacturers.
- Self-inspection reports and inspection reports from insurance carriers, government agencies, and consultants.
- Records of previous injuries and illnesses, such as OSHA 300 and 301 logs and reports of incident investigations.
- Workers' compensation records and reports.
- Patterns of frequently-occurring injuries and illnesses.
- Exposure monitoring results, industrial hygiene assessments, and medical records (appropriately redacted to ensure patient/worker privacy).
- Existing safety and health programs (lockout/tagout, confined spaces, process safety management, personal protective equipment, etc.).

- Input from workers, including surveys or minutes from safety and health committee meetings.
- Results of job hazard analyses, also known as job safety analyses.

Information about hazards may be available from outside sources, such as:

- OSHA, National Institute for Occupational Safety and Health (NIOSH), and Centers for Disease Control and Prevention (CDC) websites, publications, and alerts.
- Trade associations.
- Labor unions, state and local occupational safety and health committees/coalitions ("COSH groups"), and worker advocacy groups.
- Safety and health consultants.

Action item 2: Inspect the workplace for safety hazards

Hazards can be introduced over time as workstations and processes change, equipment or tools become worn, maintenance is neglected, or housekeeping practices decline. Setting aside time to regularly inspect the workplace for hazards can help identify shortcomings so that they can be addressed before an incident occurs.

How to accomplish it

- Conduct regular inspections of all operations, equipment, work areas and facilities. Have workers participate on the inspection team and talk to them about hazards that they see or report.
- Be sure to document inspections so you can later verify that hazardous conditions are corrected. Take photos or video of problem areas to facilitate later discussion and brainstorming about how to control them, and for use as learning aids.
- Include all areas and activities in these inspections, such as storage and warehousing, facility and equipment maintenance, purchasing and office functions, and the activities of on-site contractors, subcontractors, and temporary employees.
- Regularly inspect both plant vehicles (e.g., forklifts, powered industrial trucks) and transportation vehicles (e.g., cars, trucks).
- Use checklists that highlight things to look for. Typical hazards fall into several major categories, such as those listed below; each workplace will have its own list:

    - General housekeeping
    - Slip, trip, and fall hazards
    - Electrical hazards

- Equipment operation
- Equipment maintenance
- Fire protection
- Work organization and process flow (including staffing and scheduling)
- Work practices
- Workplace violence
- Ergonomic problems
- Lack of emergency procedures

Before changing operations, workstations, or workflow; making major organizational changes; or introducing new equipment, materials, or processes, seek the input of workers and evaluate the planned changes for potential hazards and related risks.

Note: Many hazards can be identified using common knowledge and available tools. For example, you can easily identify and correct hazards associated with broken stair rails and frayed electrical cords. Workers can be a very useful internal resource, especially if they are trained in how to identify and assess risks.

Action item 3: Identify health hazards

Identifying workers' exposure to health hazards is typically more complex than identifying physical safety hazards. For example, gases and vapors may be invisible, often have no odor, and may not have an immediately noticeable harmful health effect. Health hazards include chemical hazards (solvents, adhesives, paints, toxic dusts, etc.), physical hazards (noise, radiation, heat, etc.), biological hazards (infectious diseases), and ergonomic risk factors (heavy lifting, repetitive motions, vibration). Reviewing workers' medical records (appropriately redacted to ensure patient/worker privacy) can be useful in identifying health hazards associated with workplace exposures.

How to accomplish it

- Identify chemical hazards –review SDS and product labels to identify chemicals in your workplace that have low exposure limits, are highly volatile, or are used in large quantities or in unventilated spaces. Identify activities that may result in skin exposure to chemicals.
- Identify physical hazards –identify any exposures to excessive noise (areas where you must raise your voice to be heard by others), elevated heat (indoor and outdoor), or sources of radiation (radioactive materials, X-rays, or radiofrequency radiation).

- Identify biological hazards –determine whether workers may be exposed to sources of infectious diseases, molds, toxic or poisonous plants, or animal materials (fur or scat) capable of causing allergic reactions or occupational asthma.
- Identify ergonomic risk factors –examine work activities that require heavy lifting, work above shoulder height, repetitive motions, or tasks with significant vibration.
- Conduct quantitative exposure assessments –when possible, using air sampling or direct reading instruments.
- Review medical records –to identify cases of musculoskeletal injuries, skin irritation or dermatitis, hearing loss, or lung disease that may be related to workplace exposures.

Note: Identifying and assessing health hazards may require specialized knowledge. Small businesses can obtain free and confidential occupational safety and health advice services, including help identifying and assessing workplace hazards, through OSHA's On-site Consultation Program.

Action item 4: Conduct incident investigations

Workplace incidents –including injuries, illnesses, close calls/near misses, and reports of other concerns– provide a clear indication of where hazards exist. By thoroughly investigating incidents and reports, you will identify hazards that are likely to cause future harm. The purpose of an investigation must always be to identify the root causes (and there is often more than one) of the incident or concern, in order to prevent future occurrences.

How to accomplish it

- Develop a clear plan and procedure for conducting incident investigations, so that an investigation can begin immediately when an incident occurs. The plan should cover items such as:
    - Who will be involved
    - Lines of communication
    - Materials, equipment, and supplies needed
    - Reporting forms and templates
- Train investigative teams on incident investigation techniques, emphasizing objectivity and open-mindedness throughout the investigation process.
- Conduct investigations with a trained team that includes representatives of both management and workers.
- Investigate close calls/near misses.

- Identify and analyze root causes to address underlying program shortcomings that allowed the incidents to happen.
- Communicate the results of the investigation to managers, supervisors, and workers to prevent recurrence.

Effective incident investigations do not stop at identifying a single factor that triggered an incident. They ask the questions "Why?" and "What led to the failure?" For example, if a piece of equipment fails, a good investigation asks: "Why did it fail?" "Was it maintained properly?" "Was it beyond its service life?" and "How could this failure have been prevented?" Similarly, a good incident investigation does not stop when it concludes that a worker made an error. It asks such questions as: "Was the worker provided with appropriate tools and time to do the work?" "Was the worker adequately trained?" and "Was the worker properly supervised?"

Note: OSHA has special reporting requirements for work-related incidents that lead to serious injury or a fatality (29 CFR 1904.39). OSHA must be notified within 8 hours of a work-related fatality, and within 24 hours of an amputation, loss of an eye, or inpatient hospitalization.

Action item 5: Identify hazards associated with emergency and nonroutine situations

Emergencies present hazards that need to be recognized and understood. Nonroutine or infrequent tasks, including maintenance and startup/shutdown activities, also present potential hazards. Plans and procedures need to be developed for responding appropriately and safely to hazards associated with foreseeable emergency scenarios and nonroutine situations.

How to accomplish it

- Identify foreseeable emergency scenarios and nonroutine tasks, taking into account the types of material and equipment in use and the location within the facility. Scenarios such as the following may be foreseeable:

    - Fires and explosions
    - Chemical releases
    - Hazardous material spills
    - Startups after planned or unplanned equipment shutdowns
    - Nonroutine tasks, such as infrequently performed maintenance activities
    - Structural collapse
    - Disease outbreaks
    - Weather emergencies and natural disasters

- Medical emergencies
- Workplace violence

Action item 6: Characterize the nature of identified hazards, identify interim control measures, and prioritize the hazards for control

The next step is to assess and understand the hazards identified and the types of incidents that could result from worker exposure to those hazards. This information can be used to develop interim controls and to prioritize hazards for permanent control.

How to accomplish it

- Evaluate each hazard by considering the severity of potential outcomes, the likelihood that an event or exposure will occur, and the number of workers who might be exposed.
- Use interim control measures to protect workers until more permanent solutions can be implemented.
- Prioritize the hazards so that those presenting the greatest risk are addressed first. Note, however, that employers have an ongoing obligation to control all serious recognized hazards and to protect workers

Cost of Construction Injuries

Costs of construction accidents to employers

Abstract

This paper takes up the recommendation of the British Robens Committee Report on Safety and Health at Work, to undertake the detailed costing of occupational accidents on an industrial basis, similar to that advocated for the economy as a whole. The immediate objective of the research was to derive consistent cost estimates of industrial accidents across a broad spectrum of firms within the construction industry. A sample of 2100 construction accidents, stratified by accident severity, formed the basis of what was possibly the largest industry-wide appraisal carried out in this area. Questionnaire surveys were undertaken with employers and injured persons representing all sectors of work within the industry and all areas of Great Britain.

The surveys established those direct costs of occupational accidents within the industry which are directly measurable in financial terms, as well as indirect costs which are measured first in labour time and subsequently translated into financial equivalents. These costs are then compared with external effects, such as insurance premiums, which are determined by accidents occurring within

only a few firms in the industry but whose costs are carried by all of them together.

The results of the survey, considered by injury severity, firm turnover range, sector of employment and the impact of the growing body of self employed and subcontracted labour, clearly demonstrate the wide disparity between average insurance premiums within the industry and all combined uninsured costs associated with any one accident. The paper concludes that only the very largest firms can hope to influence the size of premium by improving their safety performance over a period of years and that the additional ‘hidden’ costs measured by the survey are not, by comparison with insurance premiums, sufficient to act as an incentive to invest in greater accident prevention

Legal Implications Compensation

People work in order to earn money, but the structure of compensation is quite diversified. The two broadest categories are salaries and wages. Salaries tend to be paid every other week or monthly; wages are typically calculated by the hour but paid by the week. As a consequence of legislative language, salary-earning employees are sometimes referred to as "exempt" employees and hourly workers as "non-exempt"; in other words the first are exempt from the requirements of Fair Labour Standards Act (discussed below), the latter group are covered. Compensation may also take the form of commissions paid to sales people based entirely on some percent of the goods or services they sell; this type of compensation is often combined with a minimal salary to even out the ups and downs of commission earnings—but people on pure commission who fail to "earn back" their base salary rarely continue in the job long. Piece work, where pay is based on actual performance of some job measured by units produced, is a variant of this approach. People serving as wait-personnel in restaurants are typically compensated by a low wage inadequate to support them: they get the majority of their income from tips. In the so-called New Economy which began emerging in the 1990s, characterized by cutbacks and layoffs of salaried and professional employees, many individuals became self-employed of necessity but, often, continued working in actual "jobs," much as before. The compensation of such people is based on contract revenues, but they receive no fringe benefits and are required to pay their own payroll taxes.

Compensation has a legal status and, once engaged, people can use the courts to enforce the employment agreement. Employee benefits ("fringe benefits") have another status: they are provided at the employer's option and may be withdrawn at will. As such they are not strictly speaking compensation although, in practice, they are viewed as a part of the full compensation "package." The employer's payment of premiums for certain types of fringe benefits, such as health care coverage and insurance policies (disability, life

insurance), are not viewed under tax law as part of the employee's taxable income. Others, such as the provision of an automobile or housing, are taxable and therefore fall under the definition of "compensation."

COMPENSATION AND TIME

For the non-exempt part of the workforce hours spent on the job are the measure of compensation to be paid. Time spent at work is regulated by the government, and laws govern pay scales over and above the specified work week, typically 40 hours. The vast majority of exempt workers are also required to work a fixed number of hours a week—but the hours may be flexible under "flextime" rules set by the employer. For exempt employees, pay for "overtime" is not controlled by law in most cases. In other words, the typical administrative/professional/executive employee is expected to work 40 hours—and as many more as the job may require, the extra hours compensated, if at all, by bonuses or time off. In the case of people working for commissions, time spent on the job is only incidentally related to compensation. Normally, of course, such people spend a lot of time working—but one can imagine the highly charismatic (and lucky) sales person who, in a couple of hours a month, can move a million dollars worth of real estate….

COMPENSATION LAWS

The Fair Labour Standards Act of 1938 (FLSA) is in a sense the basic law controlling employment and compensation issues and, through amendments passed later, the management of benefits packages. FLSA sets minimum wage, overtime pay, equal pay for men and women, controls child labor, and establishes record keeping requirements. On the whole FLSA is aimed at protecting the non-exempt work force—which was the overwhelming majority of all workers at the time of the law's passage. Since that time the profile of the workforce has greatly change; amendments to FLSA have in part reflected these changes. As illustrated by state over-rides of FLSA's minimum wage requirements (see below), states also actively regulate compensation and other aspects of the workplace.

The chief amendment of FLSA was passage of the Equal Pay Act of 1963 (EPA). EPA prohibits unequal compensation of men and women in the same workplace doing similar jobs. EPA makes exceptions for seniority, allows the use of merit systems, and recognizes compensation systems based on performance. EPA requirements do not differentiate between exempt and nonexempt employees. Other legislation related to employment compensation issues includes: 1) the Consumer Credit Protection Act of 1968 which deals with wage garnishments; 2) the Employee Retirement Income Security Act of

1974 (ERISA), which regulates pension programs; 3) the Old Age, Survivors, Disability and Health Insurance Program (OASDHI), which forms the basis for most benefits programs; and 4) legislation implementing unemployment insurance, equal employment, worker's compensation, Social Security, Medicare, and Medicaid programs and laws.

MAJOR COMPENSATION ISSUES

The two major issues related to compensation are the adequacy of the compensation, addressed by minimum wage laws, and pay equity—between women and men and between racial and ethnic groups—addressed by EPA and social anti-discrimination statutes.

Minimum Wage

Non-exempt employees, for whom the definition is intrinsically tied to time, are also guaranteed a minimum wage of not less than $7.25 per hour, effective July 24, 2009, under the FLSA. Six states (Alabama, Arizona, Louisiana, Mississippi, South Carolina, and Tennessee) have no minimum wage. Fifteen states have higher minimum wage than the U.S. as a whole: Alaska, California, Connecticut, Delaware, Florida, Hawaii, Illinois, Maine, Massachusetts, Minnesota, New Jersey, New York, Oregon, Washington, and Wisconsin. The highest wage is in Oregon, $7.63 an hour; in 2006 Connecticut had a $7.40 per hour minimum wage to be raised to $7.65 in 2007. The rest of the states have the same minimum wage as the national rate. Under the federal rules, a non-exempt worker is entitled to receive the highest minimum wage available in the place where he or she works. Changes in state law are monitored by the U.S. Department of Labour and may be consulted at Minimum Wage Laws in the States.

Equal Pay for Women and Men

Detailed data comparing income of men and women in the same occupation are not routinely collected so that the pay-equity issues remains somewhat in the dark, but more general data series give an indication of overall patterns. Based on data published by the U.S. Census Bureau, the average income of a man in 1954, but measured in 2004 dollars, was $20,992 a year. The average income of a woman, using the same method of calculation, was $9,358. On average, in 1954 a woman earned 44.6 percent of what a man earned. Women's earnings were 41.1 percent of men's in 1964, thus showing a decline, 42.2 percent in 1974 (still down from 1954), were up to 49.3 percent in 1984 but dropped again to 43 percent in 1994. In 2004, average male income was $42,832, average female income was $24,998. A gap of $17,834 separated men from women, but

women were earning an all time high of 58.4 percent of what men earned on average.

In this 50-year period, women's income grew at a faster rate than men's (1.98 percent a year versus men's income at 1.44 percent). Women's participation rate in the work force grew in this period as well: female participation in the workforce increased from 34 percent to 59.2 percent, 1954 to 2004. At the same time, the difference in male-female income averaged around $17,000 a year in this period, strongly suggesting that women had a competitive advantage in the labor market. This is further substantiated by data, published in Social Trends and Indicators USA showing that more men than women (on a percentage basis) are laid off during periods recessions. In a 2002 survey conducted by the U.S. Bureau of the Census and published in Current Population Survey data showing income differentials between men and women of the same educational attainment are presented. This study showed that income differentials were substantial across the board: 2000 data showed women on average earning 57.5 percent of what men earned. The differentials were the following: for less than 9th grade education, 59.9 percent; for high school graduates, 59.3; for bachelor's degree, 56.0; for masters, 59.7; for professional degrees, 55.9; and for doctoral degrees, 60.3 percent of what men with the same education attainment level earned.

Racial and Ethnic Differences

The U.S. Bureau of the Census data cited above for all men and women also provide a look at racial and ethnic difference—and difference between men and women in those groups. Data cited are for 2004 only because long-term data are not uniformly available. The highest average earnings are achieved by Asians. Asian women have the highest earnings among all women but earn only 61.1 percent of the income of Asian males. Lowest earnings were reported for Hispanics, again for both males and females. Hispanic females earned 66.5 percent of what Hispanic males earned. Whites had the second highest earnings, but white women lagged farthest behind. They had 56.9 percent of white males' earnings. Black women earned 75.5 percent of black males' earnings. For these four racial and ethnic group comparisons, black women were highest in relation to men.

COMPENSATION IN THE SMALL BUSINESS SECTOR

According to a Wells Fargo press release, announcing the latest Wells Fargo/Gallup Small Business Index, "Sixty percent of small business owners see the amount of compensation they can offer an employee as a critical disadvantage when compared to larger companies."

Are small business owners simply grumbling? No. Data for 2001 from the Census Bureau on firm size measured by employment and payroll show that the smaller the firm, the lower the average payroll per employee. Companies with 10,000 or more employees averaged $39,789 per employee, the smallest firms (1-4 employees) averaged $27,299. With the exception of companies with 5-9 employees, which were even lower than the smallest at $26,706, at each step up the size-scale payroll per employee went up. Small firms dominate the corporate population. Firms with less than 100 employees were 98 percent of all firms employing people, those with 100 or more employees were 2 percent of companies. But the small firms employed 36 percent of people working for companies in 2001 (41 million) and large firms employed 64 percent (74 million). In 2001 companies with fewer than 100 employees had payroll costs of $29,138 per employee, companies with 100 or more employees had costs of $37,265 per employee, for a differential of $8,127 a year.

In the mid-2000s, indeed in earlier periods as well, small business had certain advantages: it was adding while the large companies were shedding jobs. The small business sector also offers a work environment that is attractive to many individuals and this fact can be turn to an advantage when recruiting—even if with lower salaries. These include hands-on involvement in business activity, absence of bureaucracy, flexible and often more varied job assignments, more rapid and rational decision processes, and the ability of a small business to adapt to the special needs of an employee. Some employees also value closer contact with the customer; yet others, especially those with entrepreneurial ambitions, feel that they can learn more about business in a small enterprise than embedded deep in the structure of a large one. A practical aid for the small business owner offered by the Bureau of Labour Statistics is an extensive and reasonably up-to-date tabulation of wages actually paid per occupation by area. This is the BLS Wages by Area and Occupation Program, accessible on the internet. Close study of what wages actually are paid often shows that prevailing rates are frequently much more modest than generally believed because of local or regional economic conditions

Legal Implications Compensation

What is the major federal law affecting compensation?
The oldest US labour law is the US Fair Labour Standards Act (FLSA), often called the wage and hour law. It has four provisions that affect compensation programs. It has four provisions that affect compensation programs. These provisions concern minimum wages, overtime pay, record keeping requirements, and equal pay.

What is the significance of compensation?

From a manager's point of view, the **compensation** package offered to a company's employees is essential not only because it costs money, but because it is likely to be the primary reason the employees work for the firm. **Compensation** packages with good pay and advantages can help attract and retain the best employees

What are the four types of compensation?

The Four Major Types of Direct Compensation: Hourly, **Salary**, Commission, Bonuses. When asking about compensation, most people want to know about direct compensation, particularly base pay and variable pay. The four major types of direct compensation are hourly wages, **salary**, commission and bonuses.

What are the principles of compensation?

Principles of compensation management • Internal and external equity – Organization must compensate their employees according to their qualification, experience, skills, knowledge, job responsibilities and performance. This is called internal equity

The Law and Compensation and Benefits

Overview: A major constraint upon offering pay and benefits, as well as establishing systems to administer these rewards, is the law of the land. This chapter describes these laws and their effects.

Corresponding courses

Federal Employment Laws That Impact Compensation and Benefits

INTRODUCTION

A great many things influence the compensation of the employees of any organization. Some of these are external to the organization, such as the labor market and the law. Some are internal to the organization, such as organizational culture and policies. Some are part of the employee, such as skill and performance. This chapter is the first of three chapters that describe these external and internal influences on compensation - its focus is that of the legal environment.

THE LEGAL ENVIRONMENT

The legal environment in which U.S. compensation administration is practiced consists of federal and state legislation and the regulations imposed by executive branches of these governments. In the case of some developing legal concepts, case law (court decisions) represents the public position. In these forms, government is stating public intentions or guides to decision makers. Although private organizations tend to characterize these laws, regulations, and court decisions as constraints, they may also represent opportunities. It is difficult to portray this legal environment briefly. In essence, the "rules" state that compensation must not be too low or (at times) too high, but that within these limits compensation decisions should be left to the parties involved. Also, in the interest of fairness, certain groups have been protected, and all must be paid when wages are due. Unfortunately, governments have not labelled the laws, regulations, and cases according to categories of compensation. Nor indeed have they limited them to compensation matters. Because our concern is with benefits and compensation, we will focus on the guides of concern to benefit and compensation decision makers.

THE FAIR LABOR STANDARDS ACT

The oldest US labour law is the US Fair Labour Standards Act (FLSA), often called the wage and hour law. It has four provisions that affect compensation programs. It has four provisions that affect compensation programs. These provisions concern minimum wages, overtime pay, record keeping requirements, and equal pay. (We say "tired" because many of its dollar limits have not been changed in sixty years.)

Minimum wage

Minimum-wage provisions set a floor on the amount of pay an employee must receive. The minimum wage is currently $7.25 per hour effective July 24, 2009. It was signed into law on May 25, 2007 as a rider to the U.S. Troop Readiness, Veterans' Care, Katrina Recovery, and Iraq Accountability Appropriations Act, 2007. There is no consistent change process for the minimum wage. In the past, Congress has raised the minimum wage by amending the FLSA whenever the floor falls below about 50 percent of average hourly earnings. In 2003 the minimum wage had fallen to 38% of average hourly earnings. Most states have enacted their own minimum wage laws. All but five states have their own minimum wage, most of them higher than the national minimum. These state minimum wage rates prevail if they are higher than the national rate. See www.dol.gov/whd/minwage/america.htm for information regarding state minimum wages. For Canadian minimum wages by province, visit the Government of anada minimum wage database.

The minimum wage is a contentious concept. Advocates claim that some minimum wage is required in society because of the imbalance of power between the employer and employee. This is particularly true in the lower levels of the economy. By having a minimum wage, the country is reducing the dependence of some people on the "safety net" of society and thus lowering the cost of government. Opponents of the minimum wage claim that it creates unemployment in the lowest level of workers and puts a hard burden on small businesses.[1]

Living wage

Noting that minimum wage increases have lagged behind changes in the cost of living, advocates are moving beyond the concept of a minimum wage to that of a living wage. A living wage is one at which employees can support their families above the federal poverty line. Over 50 local government entities have passed living wage ordinances. These ordinances require any organization doing business with the entity to pay their employees a minimum living wage. These ordinances range from $11.75 in Minneapolis, Minnesota, to $23.93 in San Jose, California. Government entities are not alone in instituting a living wage; some companies are joining in. These companies claim that subscribing to a living wage results in the following benefits:

- reduces turnover and absenteeism, thereby lowering recruitment and training costs
- increases productivity
- increases morale and commitment to the company
- improves the community

For information on living wage levels for various locations, go to: http://livingwage.mit.edu/

FLSA Coverage

Coverage of the FLSA has been extended over time. Today, the minimum wage provisions cover almost all employers. Formally, covered employers are those with at least two employees engaged in interstate commerce, producing goods for interstate commerce, or having employees who handle, sell, or otherwise work on goods or materials produced for or moved in interstate commerce. Not surprisingly, this has been interpreted to cover almost all employers. Retail or service establishments with any significant annual gross sales are covered. Construction companies, laundries, dry cleaners, and private hospitals and schools are covered regardless of volume of business. Practically speaking, just about every business is covered unless it qualifies for one of the special exemptions (very small retailers, fishing and fish processing, seasonal

amusement and recreational establishments). In some cases jobs that are governed by some other federal labor law, such as the Railway Labor Act may not fall under the FLSA.

Exempt employees

Not all employees are covered by the FLSA. The act separates jobs into exempt and nonexempt. Organizations often use this distinction to establish very different human resource policies, not only those pertaining to compensation but other policies regarding how employees are to be treated.

Exempt. As suggested, these are employees who are not subject to the requirements of the FLSA. Such employees are considered salaried and are generally paid a fixed salary regardless of hours worked.

Non exempt. These are employees who are subject to the minimum wage and overtime provisions of the FLSA. They must be paid at time and a half for all hours worked over forty in any one week.

There are some jobs and/or organizations that are exempt under the act. For a list of these jobs go to: www.dol.gov/elaws/esa/flsa/screen75.asp

The Department of Labour released new FLSA regulations in 2004 and on January 1, 2020, new rules to update them. The 2004 regulations simplify the tests for determining an employee's exempt status and are meant to reduce litigation costs. The determination of whether a specific job is exempt or nonexempt depends on (a) how much an employee is paid, (b) how they are paid, and (c) what kind of work they do.

Salary Level Test. Employees who were paid less than $23,660 a year ($455 a week) were generally non exempt. Those paid over $100,000 a year were exempt provided they performed at least one of the duties of the executive, administrative, or professional categories listed below (this is referred to as the highly compensated exemption or HCE). In 2020, the salary level tests were changed to $35,568 a year ($684 a week) for generally non exempt employees and $107,432 a year for HCEs.

Salary Basis Test. A salary is a predetermined amount of pay that constitutes all or part of the employee's compensation for the pay period. This predetermined amount is a fixed amount and may not be reduced based on the quality or quantity of the work performed. A salary is generally expressed as an amount paid per week, per month or per year. Generally speaking, if the exempt employee performs any work during the workweek, he or she must be paid the full salary amount. An employer may not make deductions from an exempt employee's pay for absences caused by the employer or by the operating requirements of the business. If the exempt employee is ready, willing and able

to work, deductions from the employee's pay may not be made when no work is available.

Duties Test. The major groups of exempt employees are executives, administrative employees, professional employees, computer-related occupations and outside sales personnel whose jobs match the definitions provided by the Wage and Hour Division (WHD) of the Department of Labor. Placing people on salary does not by itself make them exempt, but where the match between an organization's job and the WHD definitions leaves some room for question, amount of weekly pay decides. Employers may seek permission to pay less than the minimum wage to apprentices, handicapped workers, or full-time students.

Executives.

- The employee's primary duty must be managing the enterprise, or managing a customarily recognized department or subdivision of the enterprise;
- The employee must customarily and regularly direct the work of at least two or more other full-time employees or their equivalent; and
- The employee must have the authority to hire or fire other employees, or the employee's suggestions and recommendations as to the hiring, firing, advancement, promotion or any other change of status of other employees must be given particular weight.

Administrative

- The employee's primary duty must be the performance of office or non-manual work directly related to the management or general business operations of the employer or the employer's customers; and
- The employee's primary duty includes the exercise of discretion and independent judgment with respect to matters of significance.

Learned Professional

- The employee's primary duty must be the performance of work requiring advanced knowledge, defined as work which is predominantly intellectual in character and which includes work requiring the consistent exercise of discretion and judgment;
- The advanced knowledge must be in a field of science or learning; and
- The advanced knowledge must be customarily acquired by a prolonged course of specialized intellectual instruction.

Creative Professional

- Primary duty must require invention, imagination, originality, or talent in a recognized field of artistic or creative endeavor

Computer Professional

- The employee must be employed as a computer systems analyst, computer programmer, software engineer or other similarly skilled worker in the computer field performing the duties described below;
- The employee's primary duty must consist of:

  - The application of systems analysis techniques and procedures, including consulting with users, to determine hardware, software or system functional specifications;
  - The design, development, documentation, analysis, creation, testing or modification of computer systems or programs, including prototypes, based on and related to user or system design specifications;
  - The design, documentation, testing, creation or modification of computer programs related to machine operating systems; or
  - A combination of the aforementioned duties, the performance of which requires the same level of skills

Outside Salespersons

- The employee's primary duty must be making sales (as defined in the FLSA), or obtaining orders or contracts for services or for the use of facilities for which a consideration will be paid by the client or customer; and
- The employee must be customarily and regularly engaged away from the employer's place or places of business.
- The salary requirements of the regulation do not apply to the outside sales exemption.

In 2020 several FLSA rule changes were introduced. The standard threshold as covered earlier increased to $684 a week, or $35,568 on a yearly basis. In determining compliance with this standard salary threshold, employers can include nondiscretionary bonuses and incentive payments (including commissions) to satisfy up to 10 percent of the new standard salary level. This refers to “metric-specific” or pay- for-performance incentive plans, which most organization are now incorporating into their total rewards programs. Also, the annual compensation threshold for HCEs is set to $107,432.

Overtime

The FLSA requires that nonexempt employees be paid 150 percent of regular pay for all hours worked in excess of 40 per week. The rationale for this was originally to help spread work out among more workers during the depression by making it more expensive to give a worker more hours than it would be to hire an additional worker. This argument is not as valid today as it was then. Today hiring another worker may well exceed the cost of paying a current worker overtime wages, given the recruitment and training costs of skilled workers, plus their benefits.

Workweek. The workweek is defined as a period of 168 hours during seven consecutive 24-hour periods. An employer may arbitrarily decide the day and the hour the workweek begins. Hours cannot be shifted from one week to another. An exception to this rule is that a hospital may use 14-day work periods and an 80-hour breakpoint. Another exception is that some employers are permitted week-to-week balancing under a collectively bargained guaranteed-wage plan. States may have different definitions of the work week. Most significantly, many states require overtime for hours worked over eight in a single day.

Determining hours worked is not always an easy thing. Generally, if the employee is required to be on the employer's premises, the employee is considered to be working. Break times must be included by law (OSHA) but meal times may be excluded. The latest problem is the determination of hours worked when employees are "on call." **Wage Rate.** Employees are entitled to 1½ times their regular wage rate. The regular rate is the hourly pay rate plus some other forms of compensation received by the employee, such as a shift differential. Calculating overtime pay is straightforward for employees paid by the hour. For employees on a wage incentive plan, the base rate is average hourly earnings. Salaried employees' base rate is determined by (1) converting monthly to weekly salary (divide by 4 1/3) and (2) computing the hourly rate (divide by 40).

Compensatory Time. Comp time refers to time off granted to an employee for time worked beyond the work week but for which no overtime was paid. The use of comp time by private employers is illegal. However, it may be used in governmental jurisdictions. Employers may work an employee longer than his or her normal work day and then grant time off at the regular pay rate as long as the time off falls during the current work week. As implied in our discussion of minimum wages, employees who are exempt from minimum-wage provisions are exempt from overtime provisions. Employers may, of course, pay overtime to these exempt employees but are not required to do so. Additional exemptions

from overtime provisions of the FLSA are agricultural employees, truck drivers, railroad and air-carrier employees, some local delivery people, and taxi drivers.

Record keeping

Under the FLSA, employers must collect and keep certain wage and hour information on nonexempt employees. In general, the purpose of these record-keeping requirements is to permit the Wage and Hour Division to enforce the minimum-wage and overtime provisions of the FLSA. Such information as the following is required: employee's name, address, occupation, gender; definition of workweek; total hours worked each workday and workweek; basic pay; regular hourly rate; overtime pay; deductions and additions to pay; total wages for period; pay date and period; and special information - estimated tips, payments in kind.

PREVAILING WAGE LAWS

One of the major tasks in Compensation Administration is determining the market or competitive rate for jobs, often termed the "average or going rate." Another way of stating this is that there is a search for the prevailing wage. The government uses this term when it wishes to ensure that workers are being paid the average of all workers in a job category. However, the government's use of this term is more like that of "minimum wage" than of an average wage. While the calculation is of the average wage, the requirement is that the employer must pay at least the prevailing wage. In this way, the prevailing wage is a floor below which the employer may not pay. In most cases, if the employer pays more for the job than the prevailing wage, this becomes the required wage. Presently, there are two major sets of laws that require prevailing wage analysis: government contracts and immigration programs such as H-1B. Each of these has specific methodologies in which the prevailing wage is determined, and the government provides the figures for determining the prevailing wage. However, private wage surveys also can play a role in these determinations. Both federal and state governments have laws requiring contractors supplying goods or services to the government to pay "prevailing" rates.

Davis-Bacon Act.

The Davis-Bacon Act of 1931 requires the Secretary of Labor to determine prevailing rates applicable to government construction contracts in excess of $2,000. The law is controversial primarily because the Secretary has used union rates in the geographical area as the prevailing rate. Employers argue that the law does not require the Secretary to use union rates and that doing so raises wages and government expenditures. Labor leaders argue that changes in administration of the law would weaken unions and union contractors.

Walsh-Healy Act.

The Walsh-Healy Public Contracts Act of 1936 applies to employers that are a party to federal contracts for the manufacturing or furnishing of materials, supplies, articles or equipment in excess of $15,000. It requires these employers to pay prevailing wages in the industry as determined by the Secretary of Labor. Walsh-Healy also requires covered employers to pay overtime at one and a half times the base rate for all hours in excess of 8 in a day or 40 in one workweek, whichever is greater.

Service Contract Act

The McNamara-O'Hara Service Contract Act of 1965 extends Davis Bacon concepts to government contracts for services. Contractors holding service contracts of $2,500 or less must not pay service employees less than the minimum wage. Contractors holding service contracts in excess of $2,500 must pay employees no less than the wage rates and benefits found by the Department of Labor to be prevailing in the area, or no less than the compensation (pay and benefits) found in the previous contractor's collective-bargaining agreement.

Immigrant Wages

In the United States, due to a shortage of qualified applicants, particularly for professional level jobs, congress passed a number of new immigration laws to expand the number of foreign workers who may enter the United States. A major feature of these acts is that they require the employer to pay the prevailing wage. To institute this requirement the US government contracted with all State Employment Service Agencies (SESAs) to create a national salary survey covering 631 geographic areas. This wage survey was developed within the Department of Labor's Bureau of Labor Statistics and is called the Occupational Employment Statistics Survey (OES). The determination of the prevailing wage is done by the SESAs using this survey's rates or a competitive salary survey.

These rules covering immigrants' prevailing wages were codified in a Regulation, General Administrative Letter 2-98. In arriving at prevailing wage determinations, the same policies and procedures shall be followed for the permanent labour certification program, the non immigrant program pertaining to H-1B professionals in specialty occupations or as fashion models of distinguished merit and ability, and the H-2B temporary non agricultural labour certification program. The purpose of these requirements is to ensure that immigrants under these programs are paid as much as workers who are "similarly employed in the area of intended employment." This term is defined as substantially comparable jobs in the occupational category in the area of

intended employment, except that if no such workers are employed by employers other than the employer applicant in the area of intended employment, "similarly employed" means

1. Having jobs requiring a substantially similar level of skills within the area of intended employment; or
2. If there are no substantially comparable jobs in the area of intended employment, having substantially comparable jobs with employers outside of the area of intended employment.

Occupations within an OES code will be considered as meeting the criteria of similarly employed as defined above.

A complex set of regulations has evolved to cover the pay of immigrant employees (excluding agriculture workers). For instance, there is a complex set of rules related to the use of salary survey data in dealing with immigrant employees.

1. General Administrative Letter 2-98 prohibits the use of medians and requires weighted averages.
2. The United States is divided up into 633 geographic areas, and all positions fall within 820 major and sub-job group/families.
3. Most positions include first line supervision.
4. OES means are not to be used; the typical rate utilized is Level II, the 66.7 percentile.
5. "Alternative" survey data may be used under very strict guidelines. Each state varies in what data and surveys are acceptable.

Effects of Wage Floors

The effects of wage floors (both minimum-wage laws and prevailing-wage laws) have long been a matter of controversy. Economic theory shows that wage floors may reduce employment by in effect prohibiting the employment of individuals not worth the floor. Economic theory also suggests that such floors may contribute to inflation by providing targets against which non-covered employers may be compared and by restoring customary relationships when they are raised. A contrary view is that wage floors reduce poverty by keeping wages above subsistence levels. It is also argued that wage floors prevent exploitation of employees and may in fact improve employer utilization of labor training programs to make employees worth what they must be paid.[2]

Wage Ceilings

Although wage floors have existed as part of our legal environment for over 40 years, wage ceilings have usually been avoided. During times of strong

inflationary pressures, however, attempts have been made to slow wage and price advances. During World War II, a War Labor Board was charged with devising and administering controls over wage changes. During the Korean War, a Wage Stabilization Board was created to control wage and price advances. Although evaluations of their effectiveness are mixed, wartime wage controls were generally adjudged to be necessary and somewhat effective, especially during World War II. Peacetime controls have been more controversial and less effective. The effectiveness of the wage-price guidelines of the 1960s in the Kennedy and Johnson administrations remains debatable. The more stringent controls in the Nixon administration were adjudged no more effective. The weaker controls under the Carter administration were probably even less effective. Since then, no controls have been in evidence.

The wage-control techniques tried in the United States have been:

(1) a wage-price freeze for a limited period,

(2) guidelines and "jawboning" by the administration, and

(3) a wage-price review board. Another strategy, suggested but untried, is to tax organizations that exceed guidelines.

Objections to controls are that they are either ineffective or harmful to the economy, depending on the technique used. It appears the more effective the controls, the more harmful they are to the economy. Problems with wage and price controls have appeared throughout the industrial world. These controls, called income policies, are designed to improve the trade-off between wage and price stability and unemployment (the Philips curve) by political means. Although these policies have not been notably effective economically, they can achieve political effectiveness for short periods. Getting agreement among various segments of society that their interests are being served is an unsolved problem.

ASSURANCE OF PAYMENT

A final type of wage legislation is the requirement that workers be paid the wages due them. State legislation typically specifies that wages be paid at regular intervals (one week or two) and that they be paid in cash or its equivalent. Payment in scrip (private currency) is usually prohibited, as is paying employees in barrooms. These laws also specify immediate payment if an employee is discharged.

There are also laws that limit the ability of creditors to attach the wages of employees, called garnishments, and to assign wages. These laws regulate the collection of debts from employees by restricting the amount of wages that may be deducted for such debts and by prohibiting employee discharge for a single garnishment. The Consumer Credit Protection Act, for example, restricts

garnishments on worker earnings to the lesser of either (1) 25 percent of the debtor's disposable earnings for the workweek or (2) the amount by which the debtor's disposable earnings for the work exceed 30 times the minimum hourly wage. Disposable earnings are defined as compensation less legally required withholding (for Social Security and income taxes). Under this law, garnishment restrictions do not apply to federal and state tax debts, alimony and child support, or orders under bankruptcy proceedings.

Federal law preempts state law on garnishment amounts unless state law requires smaller garnishments. The federal law also forbids firing debtors for a single garnishment but not for subsequent ones. The federal anti-kickback statute, the Copeland Act of 1934, makes it illegal to require that the employees return a part of their earnings to employers or others for the privilege of working. The act applies to all federal projects and contracts. Several states have such laws to ensure that employees receive the agreed-on rates.

PAY DISCRIMINATION

Discrimination in pay is a well-documented phenomenon, although the extent of it is controversial. This topic will be dealt with in depth in Chapter 26, Discrimination in Pay. At this time we will look at the laws that relate to discrimination in pay. These laws focus on two ideas, equal pay for equal work and equal pay for work of comparable value. Both of these standards are internal to the organization. The first makes a comparison of job content for similarity whereas the second examines the jobs for their value to the organization.

Equal wages Act of 1963

The Equal Pay Act of 1963 was passed as an amendment to the FLSA. It prohibits wage differentials between men and women employed by the same establishment in jobs that require equal skill, effort, and responsibility, and that are performed under similar working conditions. The act requires that all three factors (skill, effort, and responsibility) must be substantially equal for the jobs to be adjudged equal. Likewise, working conditions must differ significantly if pay differentials are to be justified. Actually, case law has accepted "substantial equality" between jobs as sufficient for equal pay.

The equal-pay provisions do specifically approve some conditions as justifying lower pay for women than for men. Wage differentials resulting from legitimate seniority systems, merit systems, or any system that ties earnings to quantity or quality of production are permissible. Wage differentials also may be based on factors other than gender (education required by the job, profitability to the employer). Part-time workers need not be paid the same as full-time workers. Differentials paid to family heads are permitted if both male and female heads of families are paid the differential.

Employers may not lower pay to correct violations of equal-pay provisions. Instead, the pay of the affected group must be raised to that of the favored group. There are no exempt employees under the equal-pay provisions of the FLSA; nearly all employers are covered by the act, as are unions that negotiate for covered employees. Most states have had equal-pay laws predating the federal statute, but they vary greatly in provisions and method of enforcement.

Equal employment opportunity (EEO) rules and affirmative action (AA) guidelines are to be found in several laws, a number of executive orders, and some case law. The principal federal laws are the Civil Rights Act of 1964 and 1999, the Americans with Disabilities Act of 1990, Section VII; the Equal Employment Opportunity Act of 1972; the Age Discrimination in Employment Act of 1967 and its 1978 amendments; the Vocational Rehabilitation Act of 1973; and the Vietnam Era Veterans Readjustment Assistance Act of 1974. The Equal Pay Act discussed previously may also be considered EEO legislation. State laws on civil rights matters have been in effect longer but have been superseded by federal laws. Executive orders 11246 of 1965 and 11375 of 1967 are the foundations of affirmative action programs. The most important legal cases will be cited shortly. These laws create two separate types of programs.

Equal Employment Opportunity. EEO programs prohibit discrimination based on race, color, gender, religion, age, or national origin in any of the terms of employment stipulated by employers, employment agencies, or labor unions. The Equal Employment Opportunity Commission issues guides for employer actions, record keeping, and reports that represent compliance with EEO. Court cases have developed the following two types of discrimination

- **Disparate treatment.** Treating groups or individuals differently on the basis of the above-mentioned "protected groups." Example: Not hiring a woman for a sales job on the basis that she is a woman.
- **Disparate impact.** In this case, the effect of discrimination is examined. Discrimination may be assumed if a protected group is not represented in a job category as much as it's expected the group should be. A common test for adverse impact is the four-fifths rule, which states that the selection rate for any protected group must be no less than four-fifths or eighty percent of the selection rate for the group with the highest selection rate. Example:Job A is 50% minority and provides the applicants for job B, but job B is only 25% minority. A "prima facia" case of discrimination is made. The employer must then show that the reason for the discrimination is something other than the minority status.

Affirmative Action. AA programs call for positive steps to correct the results of past discrimination. Government contractors are the major group required to have AA programs, and the executive orders just mentioned spell out most of

the requirements. AA programs also require employer activities, record keeping, and periodic reports. The handicapped and Vietnam veterans are covered by both EEO and AA requirements. Employer coverage varies somewhat under the different legislation and regulations. Compensation and benefits is also affected by the Office of Federal Contract Compliance Programs (OFCCP). This office audits governmental contractors to ensure that there is no discrimination in them. Part of these audits is to examine wages and salaries by job category and level.

AA programs are very controversial as they involve corrective steps in which minorities are given special treatment in order to make up for past discrimination. Proponents see this as eminently fair, but opponents view it as a form of reverse discrimination. In general, courts have recently taken a hard line on programs that give minorities an advantage in selection plans intended to increase the ratio of minorities in employment and education. This is making it harder for organizations, such as universities, that see advantages to having a diverse group. One useful way to view EEO and AA rules in their entirety is to use the concept of protected groups. Since compensation decisions constitute important terms and conditions of employment, they are covered by law. If compensation differentials exist between the majority employees and members of protected groups, the employer must be prepared to justify them. All compensation policies, programs, and practices of an organization should be examined as steps intended to guarantee that no discrimination against protected groups has occurred or can occur.

Comparable Worth

Comparable worth is an undeveloped legal concept that has become an important issue. It flows from the observation that women are paid less than men. More specifically, advocates of comparable worth call for equal pay for jobs of equal value. Note that this is different than equal pay, under which the jobs must be substantially equal. Equal pay concepts generally require similar duties, responsibilities, skill, and working conditions, that is, equal jobs. Comparable worth calls for equal pay for jobs of comparable value within an organization.

Three major court cases may serve to illustrate the issue. One involved nurses employed by the city of Denver.[3] The nurses charged that they were being discriminated against in pay because of their gender. They showed that they were paid a lower wage than parking-meter repairers, tree trimmers, and sign painters. They argued that these wage differentials did not reflect any differences in type or value of work but were due rather to society's tendency to pay women less for their work than men.

The nurses based their case on the Equal Pay Act and the Civil Rights Act. The former was inappropriate because the jobs compared were different. But the latter appeared to apply, because jobs dominated by women were paid less than jobs dominated by men, even though the jobs were of equal or comparable worth. The federal district court agreed with the nurses that occupations dominated by women could have historically been paid less than occupations dominated by men. It also agreed that such discrimination could in fact lead to a violation of a comparable worth criterion of fairness. But the court found against the nurses by citing the market rather than comparable worth as the proper standard. In fact the court commented, "This is a case which is pregnant with the possibility of disrupting the entire economic system of the US."

In the second case, a union charged that Westinghouse Corporation had historically established classes of jobs for wage-setting purposes that discriminated against women.[4] They demonstrated that Westinghouse had segregated "women's" jobs from "men's" jobs and set lower rates for the former. The federal district court decided that such a practice discriminated against women and ordered it stopped. In the third case, jail matrons doing work similar to but not equal to that of prison guards charged that they were being discriminated against because the difference in pay between the two jobs was much greater than the difference between the jobs themselves. In this case, the Supreme Court ruled that women who file lawsuits charging gender discrimination in pay matters may have valid claims under civil rights law.

All three of these cases have questioned the adequacy of the market as a criterion of job worth. Proponents of comparable worth argue that because women have been "crowded" into certain occupations, the labour market discriminates against them.[6]

Job evaluation as a formal method of comparing jobs is logically a potential solution. To the extent, however, that different job-evaluation plans are used for men's and women's jobs, the crucial job comparisons are not made. Also, to the extent that job-evaluation plans are developed on the basis of market wage rates for key jobs, job evaluation and market rates are not separate criteria.[7] It is just as easily argued that job evaluation plans cause and perpetuate discrimination when they impose a measurement system developed by predicting a discriminatory environment. (One of the oldest point-factor plans continues in use today although its measures were developed to predict the pay of bank workers in Philadelphia in the late 1940s). The issue of comparable worth will arise at several points in this book. At present it seems best to label it an undeveloped legal concept that may be settled by further court cases or by legislation. As an issue for compensation administrators, it seems important to recognize that wage decisions under our system are made for decentralized units. Thus, the issue is whether jobs and/or people in the organization are being

paid on a non discriminatory basis. The larger issue of differences between men's and women's pay is beyond the control of the organization's decision makers. Pay discrimination is dealt with in more depth in Chapter 26, Discrimination in Pay.

The Americans with Disabilities Act of 1990

The Americans with Disabilities Act (ADA) has a limited but important relationship to Compensation Administration. The act requires that the "essential functions" of a job be defined to see if a disabled person could perform those functions. The logical place to find this information is in a job description. The problem is that since the major function of job descriptions in most organizations is compensation and not selection, the design of the job description is not set up for this purpose. The result is that general or old job descriptions can often be a liability. Some go further and argue that any written job description is dangerous. This can be seen in the language of the act that states; "if an employer has prepared a written description before advertising or interviewing applicants for the job, this description shall be considered evidence of the essential functions of the job." Despite these concerns, a properly developed job description is still the best defence. It should be noted that there is nothing that prevents the employer from changing the nature of the job and therefore its description as changes take place within the organization.

COLLECTIVE BARGAINING

The legal environment of compensation administration includes the rules of the game in collective bargaining. Collective bargaining is a method of determining compensation (as well as other terms and conditions of employment) and is used where employees have chosen to be represented by a union. In this case, with very minor exceptions (union security clauses and discrimination matters), collective bargaining decides the terms of employment. See Chapter 3 for an expansion of unions and collective bargaining. If employers and employees prefer to strike individual bargains, the rules are those we have been discussing.

TAX LAWS

Tax laws are an obvious part of the legal environment of compensation administration. Anyone who has ever received a paycheck is aware of income tax withholding. Less obvious, however, is the influence of tax laws on benefits and, especially, on executive compensation. Not all benefits are taxed; many are bargains in part because they are not. Some benefits provide deferred income that is not taxed until the employee receives the benefit. These provisions constitute many of the real benefits of pensions, profit sharing plans, and employee stock ownership plans. Equally important is the influence of tax laws

on employer benefit costs. These laws often encourage certain kinds of benefit programs and discourage others. Under the present US Internal Revenue Code, certain benefits are not taxed; health and life insurance are examples. Other services or perquisites may or may not be taxed. For example, services or perquisites provided only to executives are considered taxable.

Many forms of executive compensation appear, expand, and even disappear in response to changes in tax laws. Stock options, for example, seem to expire or acquire new life in this way. Various forms of deferred income and restricted stock also seem to vary in this way. For instance, in answer to perceived problems with executive compensation, congress passed the Sarbanes-Oxley Act in 2002. This act required a change in the accounting for stock options (see FAS 123) that made them less attractive and required a greater level of transparency in reporting executive pay. For all of these reasons, tax laws are an important part of the legal environment of compensation administration. Understanding tax laws is a prerequisite to designing compensation programs. The complexity of this area is discussed in Chapter 19 on Executive Pay.

BENEFITS LEGISLATION

Just as minimum and prevailing-wage laws place a floor under wage rates, so Social Security, unemployment insurance, and Workers' Compensation can be interpreted as placing a floor for benefits. The Old Age, Survivors, Disability and Health Insurance Program (OASDHI) is at least as significant to employee benefits as the FLSA is to wages. The Employee Retirement Income Security Act (ERISA) of 1974 and the 1980 amendments applying to multi-employer pensions can be considered assurance-of-benefit-payment laws.

OASDHI

More than nine out of ten workers are covered by OASDHI provisions, which form the base of most benefit programs. The only workers not covered are federal civilian employees in the federal retirement system (as of now), state and local government employees who have chosen not to participate, some agricultural and domestic workers, and employees of some nonprofit organizations who have not arranged coverage. The programs under this label provide retirement, survivors, and disability insurance; hospital and medical insurance for the aged and disabled; black-lung benefits for coal miners; supplementary security income; unemployment insurance; and public assistance and welfare services.

Social Security

Retirement, survivors, and disability insurance, as well as hospital and medical insurance for the aged and disabled are paid for by a tax on employers and

employees. These taxes, authorized by the Federal Insurance Contributions Act of 1936, constitute the FICA deductions noted on paychecks. Employer and employee taxes and the earnings subject to tax have been rising along with benefits. In order to pay for this expansion, the tax has gone up over the years. In 2000, only the first $76,200 in earnings were taxed. This limit rose to $90,000 in 2005, and by 2020 was $137,700. This limit is very likely to keep rising.

Social Security also imposes some record keeping and reporting requirements on employers: amounts and dates of wage payments; amount of tips received; name, address, occupation, periods of employment; and Social Security number of each employee receiving wages. The W-2 form that each employer must provide each employee by January 31 for the previous calendar year is a requirement of Social Security.

Unemployment insurance

This is a state-administered program operating under general requirements set out by OASDHI. Its function is to provide partial income replacement when a worker loses a job through no fault of his or her own. Unemployment insurance (UI) is funded by a tax levied by states on employers. In a few states, employees also contribute to unemployment insurance. The employer's tax depends on benefit levels in the state and the employer's record.

The employer's tax is adjusted up or down from the standard tax depending on the employer's record or experience rating. States vary somewhat in the way they compute the experience rating, but in all of them, the greater the number of successful UI filers, the higher the tax. Successful filers must register at a public employment office or the employment office web site to file for UI. The worker's previous job must have been covered by unemployment insurance and an earnings or employment test met. To draw UI, workers must be able to work, be available for work, actively seek work, and be willing to take a suitable job. Workers must have lost jobs through circumstances beyond their control; they cannot quit without good cause and cannot have been discharged for cause. In almost all states, workers may receive UI if they are unemployed because of a labor dispute in which they are participating. Both workers and employers have the right to appeal UI-eligibility decisions. Employers concerned with their experience ratings challenge claims they deem inappropriate and carefully document discharges.

Workers' Compensation

Workers' compensation varies from state to state depending upon state laws. Because worker coverage, benefits to workers, and costs to employers vary tremendously from state to state, several national commissions have suggested federal standards. The goal of Workers' Compensation laws is to provide

medical care and income to workers who are injured on the job or who acquire an industrial illness, and to provide support to dependents if a worker is killed; it is essentially an insurance program covering work-related injuries and illnesses. States vary in whether employer self-insurance is permitted, and whether a state insurance fund must be used or whether private insurance carriers are acceptable. Benefits are usually based on a worker's wages at the time of injury and the number of his or her dependents. Maximum and minimum payments for specified injuries and total claims are typically specified by law, as are time limits for benefit payments. Costs to employers are influenced by the provisions of the state law as well as by the employer's accident record.

Health and Medical Benefits

Most US employers are required to provide health insurance coverage. There are four acts that affect health and medical benefits that employers provide:

- Patient Protection and Affordable Care Act (PPACA or ACA for short)
- Family and Medical Leave Act (FMLA)
- Consolidated Omnibus Budget Reconciliation Act (COBRA)
- Health Insurance Portability and Accountability Act (HIPAA)

The Affordable Care Act

On March 23, 2010, President Obama signed the Affordable Care Act. The Act makes available to all Americans access to affordable health insurance options. Some of the key provisions of the ACA include:

- A new Patient's Bill of Rights.
- Cost-free preventive services for many Americans.
- People with Medicare can get key preventive services for free, and more cost-effective access to brand-name drugs. Formation of Accountable Care Organizations and other programs will help doctors and health care providers work together to deliver better care.
- Open enrollment with the US Department of Health & Human Services' Health Care Marketplace that allows individuals and small businesses to compare health plans.

See www.hhs.gov/healthcare/facts-and-features/key-features-of-aca-by-year/index.html for more information.

The Family Leave and Medical Act

Passed in 1993, the purpose of the act is to provide all eligible employees with leave of up to 12 weeks per year for specified family and medical reasons.

Leave may be paid if the employee has earned paid time off. If the employee doesn't have earned paid time off, leave will be unpaid.

Such leave may be for:

- the birth of and care of a child
- adoption of a child
- care of an immediate family member with a serious health condition
- the employee's own serious health condition

The employee is to give 30 days' notice before taking such leave (when practical). The employee retains all benefits during the leave and is entitled to return to the same position or an equivalent one.

See www.dol.gov/dol/topic/benefits-leave/fmla.htm for further information.

Consolidated Omnibus Budget Reconciliation Act. The Consolidated Omnibus Budget Reconciliation Act (COBRA) entitles all eligible employees and their spouses and dependents to extend their group health benefits for up to 18 months upon leaving the employment of the employer covering them.

Under COBRA, employees are able to purchase extended health care coverage if their jobs ended for any reason other than gross misconduct or a reduction of hours. To qualify, the employee must have been a participant in the company's group health plan.Upon his/her termination, the company must provide the employee with written notice explaining the employee's rights under COBRA. The employee has 60 days from the date of notice to elect COBRA coverage. This coverage begins the day that health care coverage ended and lasts for up to 18 months (and longer in some cases). The employee pays the entire group rate premium for health care coverage plus a small surcharge, typically amounting to 102% of the monthly premium.

For more information, go to: www.dol.gov/ebsa/programs/opr/H-RES/berger.htm.

The Health Insurance Portability and Accountability Act of 1996 (HIPAA)

HIPAA established a federal role for regulating the employer group and individual insurance markets. The goal of the legislation was to provide coverage security for those currently insured. It guarantees the availability of insurance to all small employers (with 2 or more employees) and assures that individuals who leave employment are able to maintain health insurance coverage. Thus HIPAA ensures access to insurance for some employer groups and individuals who previously were unable to purchase health insurance or unable to purchase adequate coverage. HIPAA contains many provisions, including administrative rules intended to reduce the costs and administrative

burdens of health care by making possible the standardized, electronic transmission of many administrative and financial transactions that are or were carried out manually on paper. Most importantly, it allows states to pass legislation affecting employer medical plans as long as those laws are more beneficial than federal law.

What effect this will have on the number of uninsured or the price people pay for insurance is debated, although in the five years 2014 to 2019 the average cost rose about 20%. The variability among states in existing insurance legislation, and the flexibility that states are given to implement the individual market reforms, suggest that the answer to these questions will vary. Overall, HIPAA is not good news for administrators. HIPAA has made modern benefit administration evermore complex and requires administrators to constantly keep up with laws of the states in which they have employees. As states continue to pass diverse laws related to health care, it may make it all but impossible to safely manage self-insured medical plans. It may drive all the insured carriers from the market (or at least prevent carriers from insuring across state boundaries).

For more information on HIPAA, see www.dol.gov.

ERISA

The Employee Retirement Income Security Act of 1974 (ERISA) was passed to ensure that pensions offered by private industry employers met certain standards and were received by employees. ERISA does not require employers to offer pension programs, but it does require that those who do offer them comply with certain rules if they want favourable tax treatment for both their contributions and for their employees' deferral of income. ERISA requires that plans regularly provide participants with important information about features and funding. It sets minimum standards for funding, vesting, participation and benefit accrual. ERISA also requires that plan fiduciaries (those who manage a plan's assets) be accountable. Otherwise, these fiduciaries may be responsible for restoring losses to the plan. As additional insurance, ERISA allows participants to sue for benefits and breaches of fiduciary duty.

PBGC

To insure that vested benefits are paid to employees in spite of employer default, the Pension Benefit Guarantee Corporation (PBGC) was created. A covered employer pays a charge per plan participant per year into the PBGC as an insurance premium. Vested benefits of up to a certain amount per month are guaranteed to participants. The PBGC is a federal agency that assumes control of the defined benefit plan and pays basic benefits to retired workers in the event that an employer is unable to fund the defined benefit plan due to financial problems. Defined benefit plans are the only type of plan covered by

the PBGC; and the PBGC does not guarantee the following benefits: vacation pay, health care, severance pay, and other non-basic benefits.

Vesting

Under ERISA, an employee gains ownership of accrued pension rights through a period of employment. These ownership rights are obtained even if the employee leaves the organization before retirement. The process of acquiring ownership through employment time is called vesting. For defined benefit plans, an organization can use any of three vesting methods under ERISA.

1. Immediate vesting
2. 5-year cliff vesting: 0% vesting for less than 5 years of service; 100% vesting after 5 years
3. 7-year-graded vesting: 0% for years 1 and 2; 20% after year 3, plus an additional 20% each subsequent year until 100% vested after 7 years

The organization may also use a more generous vesting schedule.

ERISA also has requirements for defined contribution. For 2002 and beyond, ERISA requires companies to adopt a schedule at least as generous as one of two vesting schedules for 401(k) and 403(b) plans:

1. 3-year cliff vesting: 0% vesting for less than 3 years of service; 100% vesting after 3 years
2. 6-year graded vesting: vesting begins in the employee's second year of service; it increases by 20% each year, until the employee is fully vested at the beginning of the 6th year of employment.

The topic of the legal issues in Benefits is covered more thoroughly in Chapter 21, Characteristics of Benefit Plans.

SUMMARY

The legal environment continues to become more structured and demanding for the organization. While the basic laws in compensation were a result of the depression years, the new legislation is a function of the demands for social justice of the past 30 years. Except for the prevailing wage laws most of the laws deal with how wages or benefits are granted and not with the amount of the wages themselves.

Fair Labour Standards Act

The Fair Labour Standards Act (FLSA) continues to serve as the foundation for wage legislation.

As of July 24, 2009, the federal minimum wage is $7.25. In 2016 the exempt salary threshold was set to $35,568. In addition, the FLSA sets the standards for overtime and record-keeping requirements.

In addition, the FLSA sets the standards for overtime and record-keeping requirements.

Prevailing Wages

The US government also requires that employers who are party to federal contracts pay prevailing rates. In addition, a set of federal regulations now governs what employers can pay to immigrants.

Pay Discrimination

Equal Pay. The Equal Pay Act of 1963 was passed as an amendment to the FLSA.

The Equal Pay Act prohibits salary differentials between men and women employed by the same establishment in jobs that require equal skill, effort, and responsibility. Case law has interpreted "substantial equality" between jobs as sufficient for equal pay.

The concept of equal pay was expanded further through cases involving comparable worth. Comparable worth calls for equal pay for jobs of comparable value within an organization. Job evaluation is used to compare jobs and determine equal worth.

Equal Employment Opportunity. Equal employment opportunity (EEO) rules and affirmative action (AA) guidelines are found in several laws, a number of executive orders, and some case law.

EEO programs prohibit discrimination based on race, color, gender, religion, age, or national origin in any of the terms of employment stipulated by employers, employment agencies, or labor unions.

AA programs call for positive steps to correct the results of past discrimination.

Tax Laws

Continually revised by Congress, tax laws have an important impact on employer benefit costs. Under the present U.S. Internal Revenue Code (IRC), certain benefits are not taxed health and life insurance are examples. However, other services or perquisites may be taxed. For example, services or perquisites provided only to executives are considered taxable. Because of this, executive compensation is continually adjusted to take advantage of changing tax laws.

Benefits

In the field of benefits, there's a continuing trend toward legislation to protect employees' investment in their benefits. More than ever, it's necessary for employers and human resources professionals to know what federal law requires.

Legally required employee benefit programs include:

- Social Security
- Unemployment Insurance
- Workers' Compensation

Benefits administrators must be up to date on state and federal regulations regarding the latter two programs.

There are also three new federal acts that affect how employers administer their health and medical programs:

- Patient Protection and Affordable Care Act (PPACA or ACA for short)
- The Family and Medical Leave Act (FMLA)
- The Consolidated Omnibus Budget Reconciliation Act (COBRA)
- The Health Insurance Portability and Accountability Act (HIPAA)

Employee Retirement Income Security Act (ERISA)

ERISA was passed to ensure that pensions offered by private-industry employers met certain standards and were received by employees.

ERISA does NOT require employers to offer pension programs. But it does require that those who do offer pension programs follow certain rules if they want favourable tax treatment for the following:

- employer contributions
- employees' deferral of income

The rules include offering vesting schedules that are at least as generous as those outlined by federal legislation.

- In the field of benefits, there is a continuing trend toward legislation to protect employees' investment in their benefits. The allowance for states to pass their own laws affecting health care beginning in the late 1990s has led to ever increasing complexity for the multi-state employer. All point toward a greater role for the Internet.