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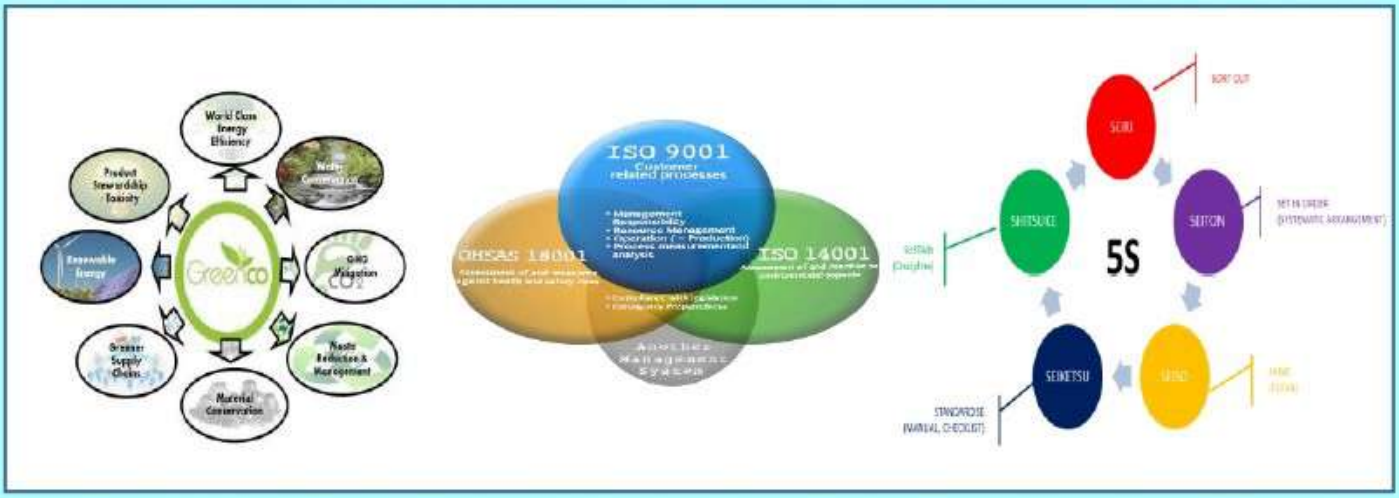

INTEGRATED MANAGEMENT SYSTEM

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FOREWORD

I am extremely happy to know that STC/Ajmer is publishing a continual series of course text books which will be useful for newly recruited JE's & SSE's. This book will surely help in grasping required knowledge to improve their awareness of latest managerial techniques.

This course text book **Integrated Management System** has been compiled as per Railway Board's prescribed module containing full technical topics regarding qualitative work which shall be handy for Supervisors while tackling day to day managerial challenges.

I congratulate Director STC/Ajmer and his faculty for bringing about all the relevant topics in the form of text book.

(Sudhir Gupta)

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FOREWORD

I am glad to know that STC/AII is publishing Technical books which shall be handy and useful for Direct recruited JE's & SSE's. This course book **Integrated Management System** contains latest relevant topics as per the Railway Board's prescribed module which will upgrade and enhance the managerial techniques & knowledge of Supervisor Trainees.

It is my hope and expectation that this book will provide effective learning experience during training and thereafter in respective work areas.

I congratulate Director and his team of STC in this endeavor.

(S.K. Gupta)

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FOREWORD

Mechanical Department is responsible for upkeep of rolling stocks including Coaches, Wagons, Diesel Locomotives in good fetal and Supervisors are the main implementing force at various C&W Depots, Diesel Sheds & Workshops. In this regard Railway board have framed suitable training module for direct recruited trainee Supervisors who are required to undergo systematic training acquiring technical & managerial inputs. STC/Ajmer plays a vital role in imparting qualitative & effective training to develop their professional aptitude.

I am pleased that STC/Ajmer is constantly publishing course books and this book is exclusively pertaining to latest management techniques. The object of the book is to present the subject matter in a most concise, compact and lucid manner.

I would like to thank Hon'ble PCME Shri Sudhir Gupta and CWE Shri S.K. Gupta for their valuable guidance in this regard. I would also like to appreciate sincere efforts done by experienced faculty Shri Mahesh Kumar Sharma in bringing about this book assisted by Shri Surendra Tak, Chief Typist and Smt. Manisha Khandey, Personal Secretary. There may be some error in the printing of book or context of topic. I shall be personally obliged if such valuable advice/suggestions are forwarded to us so as to take corrective action in revised editions.

(N.S. Patiyal)

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UNIT-1
INTEGRATED MANAGEMENT SYSTEM

What is an Integrated Management System

An Integrated Management System (IMS) integrates all of an organization's systems and processes in to one complete framework, enabling an organization to work as a single unit with unified objectives.

Organizations often focus on management systems individually, often in silos and sometimes even in conflict. A quality team is concerned with the QMS, often an EHS manager handles both Environmental and Health and Safety issues, etc.

Integrated Management Systems:

QMS - Quality Management System

A quality management system (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.) ISO 9001:2015 is an example of a Quality Management System.

- ISO 9000: 2015 Quality management system

EMS - Environmental Management System

An Environmental Management System (EMS) determines and continuously improves an organizations' environmental position and performance.

- ISO 14001 Environmental Management Systems

SMS - Safety Management System

An OHSMS determines and continually improves an organizations Health and Safety position and performance. It follows an outline and is managed like any other facet of a business, such as with marketing or engineering functions.

- OHSAS 18001 Occupational Health and Safety Management Systems

EnMS - Energy Management System

An EnMS determines and continually improves and organizations' energy usage and impact.

- ISO 50001 Energy Management System

QUALITY MANAGEMENT SYSTEM

ISO 9000: 2015 defines "Quality management system" as system to established quality policy and quality objectives and to achieve those objectives. ISO 9000 family of standard distinguish between requirements for quality management systems and requirements for products. Requirement for quality management system are specified in ISO 9000. These are generic and could apply to any organisation regardless of nature of product or service. ISO 9000 itself does not establish requirements for products.

Basics Concept of Quality

The word quality has variety of meaning.

1. Fitness for purpose: The component is to possess good quality if it works well in the equipment for which it is went quality is these as fitness for purposes.
2. Grade: Quality is a distinguished feature grade product in appearance, performance, life, reliabilities taste odor maintainability etc. this is generally called as quality character.
3. Degree of preference: Quality is the degree to which a special product is preferred over competitive product of equivalent grade based on competitive cost by customer normally called product as customer preference.
4. Degree of excellence: Quality is a measure of degree of general excellence of the product.

5. Quality of products is measure fulfilment made to the customer.
6. It may be also define as a degree of confirmation to design and specifications.
7. The composite product characteristics of engineering and manufacturing that determine the degree to which the product in use also meet the expectations of the customers.

Factor Affecting The Quality Of Product

Generally quality of any product depend upon following factors.

A. Quality of design
B. Conformance of design
C. Performance of design

Factor controlling quality of design:

1. Type of customer in market: For customer goods the important factor which governs the quality of design is the type of customer in the market. The study of optimum quality of design involves market survey it is the study of:
   a. Consuming habits of people.
   b. The price they are willing to pay for various product and service.
   c. The choice of design of the product which meet the needs of the customer.
2. Profit Consideration: From company point of view profit is more important. It is not necessary that the

company should manufacturing 100% quality products.

3. Special requirements of the product: Generally greater the requirements for strength, fatigue, resistance, life, interchangeable of manufacturing of items closer should be the tolerance to give better quality goods.
4. High quality of design means higher cost quite often it also means higher value.
   However, human ingenuity often finds way to make design both better and cheaper.

Factor controlling quality of conformance for good quality of conformance with the design any organization should ensure that-

1. The incoming raw materials are of the adequate quality.
2. The machine and tool for the job and the measuring instrument are adequate for their purpose and are kept at high level of maintenance
3. Proper selected of the process and adequate Process control.
4. The operator should be well trained and experience.
5. Proper care should be taken in shipments and storages of finished goods.
6. Inspection program is such that it gives accurate measure of the efficiency of whole system.

7. Feedback from both the internal inspection and the customer are obtained regarding quality for taking corrective action.

Quality of performance: (performance of design)

The quality of performance is concern with how well the manufactured product gives it performance it depends upon.

a) Quality of design
b) Quality of conformance

It can be best design possible but poor conformance control can cause poor performance conversely the best conformance control cannot make the product function correctly, if the design itself is not right.

Why do we need Quality management system:

In today's competitive environment, it is not quality at any cost, instead it is quality of competitive cost. In this context Quality management system provides the right framework for organisation to harness there capabilities and basis the efforts to achieve the intended business result and serve as a basis for long term group and survival.

Key objects for Quality management system to have effective management of internal process to Enhance costumer/stack holder satisfaction to sustain business competitiveness. Increase bottom line result and profitability with optimum use of resource.

Main Steps to Establish Q.M.S. in Organisation
Customer needs and expectations
Established quality policy and quality objectives of the organisation
Determine the process to achieve the quality objective
Establish document quality management system
Quality assurance
Quality control
Measure effectiveness of process towards attaining the quality objective
Reviewing for effectiveness and efficiency of process
Continual improvement

Quality management principles: Quality management system based on ISO 9001:2008, should have good look at those principles, to achieve best results:-

- Customer focused organisation
- Leadership
- Involvement of people
- Process approach
- System approach To management
- Continual improvement
- Factual approach to decision making
- Mutually beneficial supplier relationship

Quality management systems — Requirements
International Standard ISO 9001:2015

1 Scope

This International Standard specifies requirements for a quality management system when an organization:

a) Needs to demonstrate its ability to consistently provide products and services that meet customer and applicable statutory and regulatory requirements, and

b) Aims to enhance customer satisfaction through the effective application of the system, including processes for improvement of the system and the assurance of conformity to customer and applicable statutory and regulatory requirements.

All the requirements of this International Standard are generic and are intended to be applicable to any organization, regardless of its type or size, or the products and services it provides.

NOTE 1 - In this International Standard, the terms "product" or "service" only apply to products and services intended for, or required by, a customer.

NOTE 2 - Statutory and regulatory requirements can be expressed as legal requirements.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9000:2015 apply.

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ISO 9001: Requirement No	Clause	PDCA cycle
4	Context of the organization	Plan
5	Leadership	Plan, Do, Check, Act
6	Planning	Plan
7	Support	Do
8	Operation	Do
9	Performance evaluation	Check
10	Improvement	Act

ISO 9001 - Requirements

Clause, sub-clause	Requirement
4	**Context of the organization**
4.1	**The organization and its context**
4.1	Determine external and internal issues
4.1	Monitor and review information about issues
4.2	**Needs and expectations of interested parties**
4.2 a	Identify the interested parties
4.2 b	Clarify the requirements of interested parties
4.2	Monitor and review information about interested parties and their requirements
4.3	**Scope of the quality management system**
4.3	Define the scope of the QMS
4.3 a	Take into account the external and internal issues
4.3 b	Take into account the requirements of interested parties
4.3 c	Take into account the products and services
4.3	Apply any requirement of the ISO 9001 standard applicable within the scope of the QMS
4.3	Maintain the scope of the QMS as documented information
4.3	Include in the scope of the QMS justification for any requirements which cannot be met
4.4	**Quality management system and its processes**
4.4.1	Establish, implement, maintain and improve a process-based QMS
4.4.1	Determine the needed processes and their application
4.4.1 a	Determine process inputs and outputs

4.4.1 b	Determine the sequence and interaction of processes
4.4.1 c	Determine the criteria and methods to control processes
4.4.1 d	Determine and ensure the resources
4.4.1 e	Assign process responsibilities and authorities
4.4.1 f	Take into account the risks and opportunities for each process
4.4.1 g	Evaluate processes and if necessary modify them
4.4.1 h	Determine the improvement opportunities of processes and the QMS
4.4.2	Maintain documented information on process operation
4.4.2	Retain documented information on process operation
5	**Leadership**
5.1	**Leadership and commitment**
5.1.1	**General**
5.1.1 a	Assume responsibility for the effectiveness of the QMS
5.1.1 b	Establish a quality policy and quality objectives
5.1.1 c	Integrate QMS requirements in the internal process requirements
5.1.1 d	Raise awareness of the process approach and risk-based approach
5.1.1 e	Provide the necessary resources for the QMS
5.1.1 f	Raise awareness on the importance of an effective and conforming QMS
5.1.1 g	Ensure the achievement of intended results of the QMS
5.1.1 h	Support the staff contribution to the effectiveness of the QMS
5.1.1 i	Promote continual improvement

5.1.1 j	Support the leadership of managers
5.1.2	**Customer focus**
5.1.2 a	Determine and meet customer, statutory and regulatory requirements
5.1.2 b	Determine and address the potential risks and opportunities
5.1.2 c	Maintain the objective of better satisfying the customer
5.2	**Policy**
5.2.1	**Establishing the quality policy**
5.2.1 a	Establish, implement and maintain a suitable quality policy
5.2.1 b	Provide a framework to define and review the quality objectives
5.2.1 c	Include meeting the applicable requirements
5.2.1 d	Include a commitment to continuously improve the QMS
5.2.2	**Communicating the quality policy**
5.2.2 a	Maintain the quality policy as documented information
5.2.2 b	Communicate the quality policy
5.2.2 c	Keep the quality policy available
5.3	**Roles, responsibilities, authorities**
5.3	Define and communicate the responsibilities and authorities
5.3 a	Define and communicate the responsibilities and authorities
5.3 b	Define and communicate the responsibilities and authorities
5.3 c	Define and communicate the responsibilities and authorities
5.3 d	Define and communicate the responsibilities and authorities

5.3 e	Define and communicate the responsibilities and authorities
6	**Planning**
6.1	**Actions to address risks and opportunities**
6.1.1 a	Take into account risks and opportunities
6.1.1 b	Take into account opportunities
6.1.1 c	Take into account risks
6.1.1 d	Take into account risks and opportunities
6.1.2 a	Plan actions to address risks and opportunities
6.1.2 b 1	Plan the way to implement actions
6.1.2 b 2	Plan the way to evaluate actions
6.1.2	Adapt actions to risks and opportunities
6.2	**Quality objectives**
6.2.1	Establish quality objectives for processes
6.2.1 a	Choose quality objectives
6.2.1 b	Use measurable objectives
6.2.1 c	Consider applicable requirements
6.2.1 d	Adopt relevant objectives
6.2.1 e	Monitor objectives
6.2.1 f	Communicate on objectives
6.2.1 g	Update objectives
6.2.1	Maintain documented information on the quality objectives
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6.2.2 b	Plan necessary resources
6.2.2 c	Plan responsibilities
6.2.2 d	Plan deadlines
6.2.2 e	Plan the way to evaluate results
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6.3	Plan the need for changes of the QMS

6.3 a	Plan the changes
6.3 b	Plan the changes
6.3 c	Plan the changes
6.3 d	Plan the changes
7	**Support**
7.1	**Resources**
7.1.1	**General**
7.1.1	Provide the necessary resources
7.1.1 a	Take into account existing resources
7.1.1 b	Take into account the need for the use of external providers
7.1.2	**People**
7.1.2	Provide suitable people for the effective operation of the QMS and its processes
7.1.3	**Infrastructure**
7.1.3	Provide and maintain the infrastructure necessary to the functioning of processes
7.1.4	**Process environment**
7.1.4	Provide and maintain the suitable environment necessary to the functioning of processes
7.1.5	**Monitoring and measuring resources**
7.1.5.1	**General**
7.1.5.1	Provide suitable monitoring and measuring resources
7.1.5.1 a	Provide adequate resources to the specific inspections
7.1.5.1 b	Maintain resources
7.1.5.1	Retain documented information on the adequacy of inspection resources
7.1.5.2	**Measurement traceability**
7.1.5.2 a	Verify or calibrate regularly the measuring equipment

7.1.5.2 b	Identify the measuring equipment
7.1.5.2 c	Protect the measuring equipment
7.1.5.2	Conduct corrective action on previous measurement results
7.1.6	**Organizational knowledge**
7.1.6	Determine the necessary knowledge
7.1.6	Acquire, maintain and make organizational knowledge available to the extend necessary
7.1.6	Take into account the need for additional knowledge
7.2	**Competence**
7.2 a	Determine the necessary competence
7.2 b	Ensure the competence
7.2 c	Undertake activities to acquire the necessary competence and evaluate the effectiveness of these activities
7.2 d	Retain documented information on staff competence
7.3	**Awareness**
7.3 a	Ensure the staff is aware of the quality policy
7.3 b	Ensure the staff is aware of the quality objectives
7.3 c	Ensure the staff is aware of its contribution
7.3 d	Ensure the staff is aware of negative impacts
7.4	**Communication**
7.4 a	Define the subjects on which to communicate
7.4 b	Define when to communicate
7.4 c	Define with whom to communicate
7.4 d	Define how to communicate
7.4 e	Assign who will communicate
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7.5.1	**General**

7.5.1 a	Include the documented information required by the ISO 9001 standard
7.5.1 b	Select the documented information deemed necessary to the effectiveness of the QMS
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7.5.2 a	Create, identify and describe the documented information
7.5.2 b	Choose the format and the media of the documented information
7.5.2 c	Review and approve the adequacy of the documented information
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7.5.3.1 b	Control the protection of the documented information
7.5.3.2 a	Control the distribution, access and use of the documented information
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7.5.3.2 c	Control the changes of the documented information
7.5.3.2 d	Control the retention time and the removal of the documented information
7.5.3.2	Control the documented information of external origin
7.5.3.2	Protect the documented information
8	**Operation**
8.1	**Operational planning and control**
8.1 a	Plan and determine the requirements for the products and services
8.1 b 1	Establish the criteria
8.1 b 2	Establish the criteria

8.1 c	Determine necessary resources
8.1 d	Control the processes
8.1 e 1	Determine, maintain and retain the documented information on process control
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8.1	Control the outsourced processes
8.2	**Requirements for products and services**
8.2.1	**Customer communication**
8.2.1 a	Provide information to customers
8.2.1 b	Control communication with customers
8.2.1 c	Control communication with customers
8.2.1 d	Control communication with customers
8.2.1 e	Control communication with customers
8.2.2	**Determining the requirements related to products and services**
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8.2.2 a 2	Define internal requirements
8.2.2 b	Be able to respond to claims
8.2.3	**Review of requirements related to products and services**
8.2.3.1	Be able to respond to customers
8.2.3.1 a	Review explicit customer requirements
8.2.3.1 b	Review implicit customer requirements
8.2.3.1 c	Review internal requirements
8.2.3.1 d	Review statutory and regulatory requirements
8.2.3.1 e	Review gaps
8.2.3.1	Resolve gaps
8.2.3.1	Confirm requirements before accepting an order

8.2.3.2 a	Retain the documented information on the results of the reviews of requirements
8.2.3.2 b	Retain the documented information on any new or changed requirement for the products and services
8.2.4	**Changes to requirements for products and services**
8.2.4	Communicate changes to relevant persons
8.3	**Design and development of products and services**
8.3.1	**General**
8.3.1	Establish, implement and maintain a process of design and development
8.3.2	**Design and development planning**
8.3.2 a	Plan the design and development stages
8.3.2 b	Plan the design and development stages
8.3.2 c	Plan the design and development stages
8.3.2 d	Plan the design and development stages
8.3.2 e	Plan the design and development stages
8.3.2 f	Plan the design and development stages
8.3.2 g	Plan the design and development stages
8.3.2 h	Plan the design and development stages
8.3.2 i	Plan the design and development stages
8.3.2 j	Plan the design and development stages
8.3.3	**Design and development inputs**
8.3.3	Determine essential requirements
8.3.3 a	Determine functional requirements
8.3.3 b	Clarify inputs
8.3.3 c	Clarify inputs
8.3.3 d	Clarify inputs
8.3.3 e	Clarify inputs

8.3.3	Check that the input items are complete and unambiguous
8.3.3	Resolve potential conflicts between inputs
8.3.3	Retain the documented information on design and development inputs
8.3.4	**Design and development controls**
8.3.4 a	Define clearly the expected results
8.3.4 b	Conduct reviews as planned
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8.3.4 d	Validate products and services
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8.3.4 f	Ensure that the documented information is retained
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8.4.1 a	Apply the requirements for the control of products and services provided by external providers
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8.4.1	Retain the documented information on the results of the evaluation and monitoring
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8.4.3 b 3	Communicate the requirements to the external provider
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8.5.1 h	Include in the controlled conditions the activities

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8.5.2	Use appropriate means to control the unique identification of process outputs
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8.6	Check products and services with activities at appropiate stages
8.6	Release products and services after verification of conformity
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9.1.1	**General**
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9.1.1 b	Determine the methods for inspection, analysis and evaluation
9.1.1 c	Determine when to inspect
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9.1.1	Evaluate the performance and effectiveness of the QMS
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9.1.2	**Customer satisfaction**
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9.1.2	Determine methods for obtaining and using customer information
9.1.3	**Analysis and evaluation**
9.1.3	Analyse and evaluate inspection data
9.1.3 a	Use analysis results
9.1.3 b	Use analysis results
9.1.3 c	Use analysis results
9.1.3 d	Use analysis results
9.1.3 e	Use analysis results
9.1.3 f	Use analysis results
9.1.3 g	Use analysis results
9.2	**Internal audit**

9.2.1 a 1	Conduct regularly planned internal audits
9.2.1 a 2	Conduct regularly planned internal audits
9.2.1 b	Conduct regularly planned internal audits
9.2.2 a	Plan, establish, implement and update an audit programme
9.2.2 a	Take into account in the audit programme essential points
9.2.2 b	Define the scope and audit criteria
9.2.2 c	Select auditors
9.2.2 d	Communicate audit results to management concerned
9.2.2 e	Undertake a correction quickly and corrective actions if necessary
9.2.2 f	Retain the documented information on the audit programme and the audit reports
9.3	**Management review**
9.3.1	**General**
9.3.1	Proceed at least once a year to review the QMS
9.3.2	**Management review inputs**
9.3.2 a	Plan and carry out the management review
9.3.2 b	Carry out the management review taking into account the changes of external and internal issues for the QMS
9.3.2 c 1	Take into account the information on the performance of the QMS and trends
9.3.2 c 2	Take into account the information on the performance of the QMS and trends
9.3.2 c 3	Take into account the information on the performance of the QMS and trends
9.3.2 c 4	Take into account the information on the performance of the QMS and trends
9.3.2 c 5	Take into account the information on the performance of the QMS and trends

9.3.2 c 6	Take into account the information on the performance of the QMS and trends
9.3.2 c 7	Take into account the information on the performance of the QMS and trends
9.3.2 d	Take into account resources
9.3.2 e	Take into account the effectiveness of actions
9.3.2 f	Take into account improvement opportunities
9.3.3	**Management review outputs**
9.3.3 a	Include decisions regarding opportunities for continual improvement in the outputs of the management review
9.3.3 b	Include decisions regarding eventual changes to the QMS in the outputs of the management review
9.3.3 c	Include decisions regarding new resource needs in the outputs of the management review
9.3.3	Retain the documented information on outputs of the review of management
10	**Improvement**
10.1	**General**
10.1	Find improvement opportunities and implement necessary actions
10.1 a	Improve products and services
10.1 b	Reduce negative impacts
10.1 c	Improve the results of the QMS
10.2	**Nonconformity and corrective action**
10.2.1 a 1	React to the nonconformity
10.2.1 a 2	Take into account consequences
10.2.1 b 1	Examine the nonconformity
10.2.1 b 2	Investigate root causes
10.2.1 b 3	Search for similar nonconformities
10.2.1 c	Implement the necessary corrective actions

10.2.1 d	Review the effectiveness of any implemented corrective action
10.2.1 e	Update risks and opportunities
10.2.1 f	Make changes to the QMS
10.2.1	Respond proportionally to nonconformities consequences
10.2.2 a	Retain documented information on the nature of nonconformities
10.2.2 a	Retain documented information on results of implemented actions
10.3	**Continual improvement**
10.3	Improve continually the performance of the QMS
10.3	Take into account the outputs of the analysis, evaluation and management review

UNIT-2

ISO 14001 – ENVIRONMENTAL MANAGEMENT SYSTEM

The **ISO 14001 Certification** is an Environmental Management System (EMS) Standards – This standard provided the requirement of EMS and guideline for use. The ISO 14001 standard is a specific standard for Environmental Management system. The ISO 14001 (EMS) is applicable to any organization that wishes to demonstrate sound environmental performance of the organization by controlling the impacts of their activities, products and services on the environment, consistent with their environmental policy and objectives and Complying with applicable legal and regulatory requirements.

The summarized requirement details of ISO 14001 are given below:

General Requirements of Environmental Management System

Which include the requirement of – development, documentation, implementation of organization Environmental Management System as per ISO 14001 requirement.

Environmental Policy

The organization shall develop the environmental policy, which includes the top management commitments to continual improvement, prevention of pollution, comply with applicable legal requirements and other requirements to which the organization subscribes which relate to its environmental aspects. The organization's environmental policy is being communicated to all stake holders and is available to public.

Planning

Which include the requirement of – identification of Environmental aspects and their impacts and determination of significant environmental aspects, applicable legal and other requirements, objectives, targets and programme(s).

Implementation and Operation

Which include the requirement of – setting up of Resources, roles, responsibility and authority in relation with EMS requirements, determination of Competence, providing training and awareness on Environmental management system requirements, Communication, Documentation, Control of documents, setting up of the Operational control to reduce the environmental impact, determination of potential emergency situations and establishing the Emergency preparedness and response.

Checking

Monitoring and measurement of environmental performance (significant aspects and EMS objectives & targets), Evaluation of compliance, Nonconformity, corrective action and preventive action, Control of records, internal audit.

Management Review

Which include the requirement of - conduct the Management review meeting on environmental management system, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness. And assessing opportunities for continual improvement identify any need for changes to the environmental management system, environmental policy and environmental objectives and targets.

Benefits of ISO 14001 Certification

- Improve the environmental performance of the organization.
- Environmental pollution reduced.
- Compliance with Legal and regulatory requirements related to Environment.
- Awareness about preparedness of potential Emergency situation.
- Improve the business potential among the competitor.
- Reduce wastage of Energy, natural resources, Raw materials.

- Operation control over the process shall improve.
- Commitment to Nation towards reduction pollution and compliance with legal regulatory requirement shall improve.

Applicant organization shall ensure the followings prior to ISO 14001 Certification (Environmental Management System Certification)

- Implementation of Environmental Management System in the organization. Established the Quality Manual, relevant procedures and SOP's
- Conducted one complete cycle Environmental Management System Internal Audit.
- Conducted at least one Management review meeting on Environmental Management System.
- Applicable Legal requirements related to Environmental management system have been identified and compliance has been established.
- Significant Environmental Aspects has been identified and its operational control has been implemented.
- Potential Environmental emergency situation has been identified and its preparedness has been established.

ISO 14001 - Environmental Management System Certification Process

- Application review and contract Sign up between OSS and applicant organization.
- Stage-1 Audit.
- Stage-2 Audit.
- Certification decision.
- Issue of certificate.
- Surveillance audit (annually or half yearly as finalized during application review process and agreed by client).
- Re-Certification Audit (within three years before expiry of certificate).

UNIT-3

OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM

OHSAS 18001 has been developed to be compatible with ISO 9001:2008 (Quality) and ISO 14001:2004 (Environmental) management systems standards, in order to facilitate the integration of quality, environmental and occupational health and safety management systems by organisations, should they wish to do so.

Organisations of all kinds are increasingly concerned with achieving and demonstrating sound occupational health and safety (OH&S) performance by controlling their OH&S risks, consistent with their policy and objectives. They do so in the context of increasingly stringent legislation, the development of policies and other measures that foster good OH&S practices.

The advantages of an effective OHSAS management system:

- Provides a structured approach for managing OH&S
- Establishes and maintains a commitment to occupational health and safety
- Demonstrates strong commitment to safety excellence

- Organisational structures in place with clear roles and responsibilities
- Existence of a continuous improvement culture
- Strong levels of trust and communication
- Reduction in incident levels with increased measures of performance.
- Contributes to business performance by reducing cost and liabilities.

Occupational Health and Safety is based on:

Hazard identification

The process of recognizing that a hazard exists (source or situation with the potential to cause harm in terms of human injury or ill-health)

Risk assessment

The process of evaluating the risk arising from the hazard (combination of the likelihood of a hazardous event or exposure and the severity of injury or ill health that can be caused by the event of exposure)

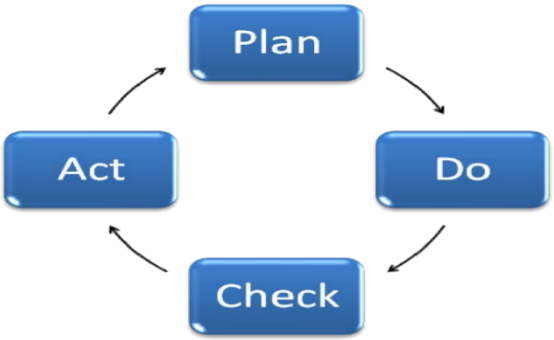
Determination of applicable controls

Measures relevant to eliminate or reduce risk to an acceptable level. Measures are based on the hierarchy of control measures.

In order to achieve an effective health and safety system it is vital for organizations to handle these with greater significance. The three aspects above provide the

ever important foundation for implementing OHSAS 18001 and without them, the overall system would surely fail. They are, theoretically, considered a part of the 'PLAN' step (explained later), but most auditors and consultants agree that these aspects should be dealt with before designing the system as a whole.

OHSAS 18001 Occupational Health and Safety Standard uses a management approach tool called the PDCA cycle. PDCA is an ongoing process that enables an organisation to establish, implement and maintain its health and safety policy based on top management leadership and commitment to the safety management system. It



consists of the following:

Plan – establish the objectives and processes necessary to deliver results in accordance with the organisation's OH&S policy

Do – implement the process

Check –monitor and measure performance against OH&S policy, objectives, legal and other requirements, and report results

Act – take actions to continually improve OH&S performance

The standard can be implemented to your whole organization or to just a part of it. The best results though come when the whole organization is working on the same system and OH&S policy is integrated into other management systems and into the culture of the organization.

Plan

The planning stage of the process requires the organization to:

- Devise an OH&S policy
- Plan for hazard identification, risk assessment and determination of controls
- Identify relevant legal requirements
- Plan for emergencies and responses
- Manage change effectively
- Devise procedures for performance measuring, monitoring and improvement
- Provide and ensure the appropriate use of safety equipment
- Train in order to introduce an OH&S culture and establish the importance of organization's safety statement, policies and objectives
- Consult employees and communicate

At first, the management has to be consulted in order for them to feel confident in supporting the new system and constantly driving it forward. Then the workforce has to be consulted. It is very likely that the lower level employees have valuable insight, ideas and feedback about the new system. Since they are the ones that are going to be most affected by it, it is logical to ensure they believe and understand the need for change. Failure to realize this could result into much resistance throughout your organization and thus result in a system that is impractical to operate.

Do

The implementation stage should be the easiest part of this process. If the planning stage is done the right way then it is just a matter of following the documentation and procedures that have been created. In order to ensure smooth implementation a lead senior manager should be in charge of the new OH&S system and at the same time each element of the process should have an ‘owner’ or a person that looks after that part of the system. This ensures the appropriate structure at your organization and effectively minimizes risk.

It is advisable to start the implementation by breaking the system down into specific elements rather than tackling it as a whole. Concentrating on specific elements in a logical order creates a solid foundation for the whole system to work efficiently.

Another important aspect of health and safety is having employees do the jobs that are suited to their competencies. A matrix should be created showing all groups of personnel, their required competencies, training and status of each. These formal procedures should instil the required awareness within your organization.

Check

The third step of the PDCA cycle consists of the following:

- Conducting internal audits
- Evaluation of legal compliance
- Identifying non-conformities and addressing them
- Thorough analysis of incidents and incidental data
- Measuring performance and monitoring

The failure to conduct internal audits periodically will most likely result in the breakdown of the system as a whole. It often happens that where there is no control, risks tend to arise especially quickly.

Any arising non-conformities should be tackled instantly using the devised corrective actions. The most effective and robust systems ensure that this process runs smoothly at all times. This means that the performance of this process should be measured as well and any non-conformities have to be dealt with. It is not only the arising non-conformities that your organization needs to think about. It’s crucial for your organization to identify

any possible emergencies and develop relevant response procedures, this is called preventative action.

When devising controls and measuring performance it is important to strike a balance between being overly bureaucratic and overly light on certain elements of the system. The OHSAS 18001 Occupational Health and Safety Management Specification is not supposed to hinder the performance of your organization but improve it.

Act

The final step is the management review, it is a vital part of the continuous improvement process and so the standard itself outlines what should be included in such a review.

Management review is done by the senior management and involves reviewing the suitability, adequacy and effectiveness of the system. It should also include assessing opportunities for improvement and the necessity to change the OH&S policy and the OH&S objectives. If changes are needed, the senior management should also provide the necessary resources for their implementation. Providing resources is a way of presenting commitment to the new health and safety system.

UNIT-4
ISO 50001:2011-
ENERGY MANAGEMENT SYSTEM

Introduction

The purpose of this International Standard is to enable organizations to establish the systems and processes necessary to improve energy performance, including energy efficiency, use and consumption. Implementation of this International Standard is intended to lead to reductions in greenhouse gas emissions and other related environmental impacts and energy cost through systematic management of energy. This International Standard is applicable to all types and sizes of organizations, irrespective of geographical, cultural or social conditions. Successful implementation depends on commitment from all levels and functions of the organization, and especially from top management.

This International Standard is based on the Plan - Do - Check - Act (PDCA) continual improvement framework and incorporates energy management into everyday organizational practices, as illustrated in Figure 1.

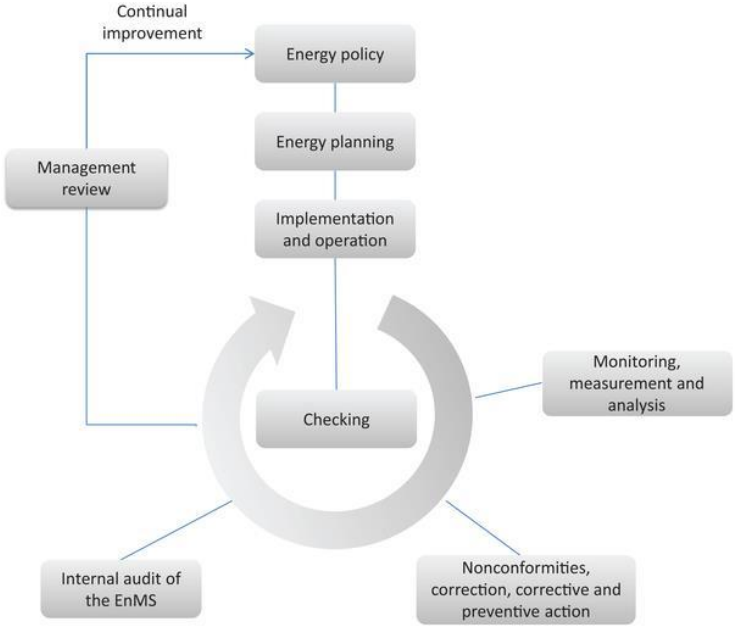
NOTE In the context of energy management, the PDCA approach can be outlined as follows:

- Plan: conduct the energy review and establish the baseline, energy performance indicators (EnPIs), objectives, targets and action plans necessary to deliver results that will improve energy

performance in accordance with the organization's energy policy;

- Do: implement the energy management action plans;
- Check: monitor and measure processes and the key characteristics of operations that determine energy performance against the energy policy and objectives, and report the results;
- Act: take actions to continually improve energy performance and the EnMS.

Figure 1 — Energy management system model for this International Standard



1 Scope

This International Standard specifies requirements for establishing, implementing, maintaining and improving an energy management system, whose purpose is to enable an organization to follow a systematic approach in achieving continual improvement of energy performance, including energy efficiency, energy use and consumption.

This International Standard is applicable to any organization wishing to ensure that it conforms to its stated energy policy and wishing to demonstrate this to others, such conformity being confirmed either by means of self-evaluation and self-declaration of conformity, or by certification of the energy management system by an external organization.

2 Normative references

No normative references are cited. This clause is included in order to retain clause numbering identical with other ISO management system standards.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 boundaries

physical or site limits and/or organizational limits as defined by the organization

3.2 continual improvement

recurring process which results in enhancement of energy performance and the energy management system

3.3 correction

action to eliminate a detected **nonconformity** (3.21)

3.4 corrective action

action to eliminate the cause of a detected **nonconformity** (3.21)

3.5 energy

electricity, fuels, steam, heat, compressed air, and other like media

3.6 energy baseline

quantitative reference(s) providing a basis for comparison of energy performance

3.7 energy consumption

quantity of energy applied

3.8 energy efficiency

ratio or other quantitative relationship between an output of performance, service, goods or energy, and an input of energy

EXAMPLE:

Conversion efficiency; energy required/energy used; output/input; theoretical energy used to operate/energy used to operate.

3.9 energy management system

EnMS set of interrelated or interacting elements to establish an energy policy and energy objectives, and processes and procedures to achieve those objectives

3.10 energy management team

person(s) responsible for effective implementation of the energy management system activities and for delivering energy performance improvements

3.11 energy objective

specified outcome or achievement set to meet the organization's energy policy related to improved energy performance

3.12 energy performance

measurable results related to **energy efficiency** (3.8), **energy use** (3.18) and **energy consumption** (3.7)

3.13 energy performance indicator

EnPI quantitative value or measure of energy performance, as defined by the organization

Note 1 to entry: EnPIs could be expressed as a simple metric, ratio or a more complex model.

3.14 energy policy

statement by the organization of its overall intentions and direction of an organization related to its energy performance, as formally expressed by top management

3.15 energy review

determination of the organization's energy performance based on data and other information, leading to identification of opportunities for improvement

3.16 energy services

activities and their results related to the provision and/or use of energy

3.17 energy target

detailed and quantifiable energy performance requirement, applicable to the organization or parts thereof, that arises from the energy objective and that needs to be set and met in order to achieve this objective

3.18 energy use

manner or kind of application of energy

EXAMPLE:

Ventilation; lighting; heating; cooling; transportation; processes; production lines.

3.19 interested party

person or group concerned with, or affected by, the energy performance of the organization

3.20 internal audit

systematic, independent and documented process for obtaining evidence and evaluating it objectively in order to determine the extent to which requirements are fulfilled

3.21 nonconformity

non-fulfilment of a requirement

[SOURCE: ISO 9000:2005, definition 3.6.2]

3.22 organization

company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its

own functions and administration and that has the authority to control its energy use and consumption

3.23 preventive action

action to eliminate the cause of a potential **nonconformity** (3.21)

3.24 procedure

specified way to carry out an activity or a process

3.25 record

document stating results achieved or providing evidence of activities performed

3.26 scope

extent of activities, facilities and decisions that the organization addresses through an EnMS, which can include several boundaries

3.27 significant energy use

energy use accounting for substantial energy consumption and/or offering considerable potential for energy performance improvement

3.28 Top management

person or group of people who directs and controls an organization at the highest level

UNIT-5
GREEN COMPANY RATING SYSTEM

1. INTRODUCTION

Businesses across the globe have begun to realize the impending impact of their actions on the environment and its contribution to the phenomenon of climate change. The achievement of higher growth with optimal use of resources and better emission and discharge standards is need of the hour. Several companies have taken proactive initiatives to integrate environmental concerns in their businesses and have improved the environmental performance and business competitiveness. Companies have started to realise that ecological and economic sustainability can go hand-in-hand. Pursuing "Green" has become the new driver for companies on the quest towards growth, competitiveness and global excellence. Numerous benefits have been achieved by companies restructuring their various business processes towards ecological sustainability.

1.1. GREEN COMPANY RATING SYSTEM

Many companies have taken numerous initiatives to reduce their ecological footprint, in several areas such as energy efficiency, water, GHG, waste reduction, etc.

With number of businesses going green on the rise and several initiatives on different areas evokes a spark in an individual's mind on "How Green is the

Company". A clear holistic mechanism is presently not available for evaluating the performance of companies on the ecological front. Against this background, CII, through an extensive stakeholder consultation and interaction with experts have developed the 'GreenCo rating' system for evaluating the 'greenness of companies'.

The Green Rating System will act as a milestone for companies pursuing green to assess where they stand and help in defining the path forward.

1.2. SCOPE OF THE RATING SYSTEM

The GreenCo rating system covers both

- Manufacturing
- Service sectors

The rating is implemented at individual manufacturing unit / service facility which are in operation for a minimum period of 3 years. In case of new plants / facilities a minimum of 2 years operational data is required. 4

1.3. SECTOR COVERAGE

The sectors that will be covered under this system are:

Manufacturing Sector

- Automobile
- Engineering
- Cement
- FMCG
- Fertilizers
- Foundry
- Glass
- Iron, Steel & Non Ferrous Metals
- Pharmaceutical & Chemicals
- Public Sector Undertakings
- Pulp & Paper
- Refineries & Petrochemicals
- Tyre & Textile

Service Sector

- IT & IT Services
- Logistics
- Airports
- Hotels
- Ports

2. BENEFITS OF THE GREEN COMPANY RATING SYSTEM

Application of GreenCo rating addresses national priorities leading to benefits, such as energy efficiency, water conservation, renewable energy, waste management, green supply chain, etc. Some of the major benefits are highlighted below:

a. Energy Efficiency

The GreenCo rating system calls for energy monitoring and accounting system as well as technology that is less energy intensive. The rating system would help the organizations to benchmark themselves at the national / international level, guides them towards becoming national / global levels of energy efficiency. Involvement of employees and building capacity of them are also part of the rating system.

b. Water Conservation

Our requirements for water to meet our fundamental needs and our collective pursuit of higher living standards, coupled with the need for water to sustain our planet's fragile ecosystems, make water unique among natural resources. The increase in global population coupled with the rising economy increase the demand for water exponentially.

The green business rating promotes sustainable use of water through “reduce, recycle, reuse and reclaim” strategies. It prescribes metering to monitoring water consumption, rain water harvesting and water use reduction strategies. Overall, this has the effect of reducing utility costs for businesses. The rating system also encourages companies to take efforts for groundwater recharge beyond the fence.

c. Renewable Energy

The adverse effects on environment caused by the production and consumption of energy have resulted in severe environmental impacts across the globe. With world economies taking commitments to reduce their share of carbon emissions contributing to the global warming; it requires countries to look at alternate sources of energy meet their growing energy demands. This not only allows for use of energy that is clean but also reduces the dependence on fossil fuels, which are major contributors of Green House Gases. Similarly, there are other sources of renewable energy that need to be explored and utilized. The Green Company Rating System encourages businesses to employ clean and renewable energy. The ultimate goal is to offset 100% of the electrical energy / thermal by renewable energy. Although the initial

investment on installing equipment for generating renewable energy is relatively high, the long term benefits of reduced maintenance cost, low operating costs and cost savings on fossil fuels makes it a lucrative proposition for businesses.

d. **Waste Management**

The waste management sector is contributing 3-5 per cent of global man-made greenhouse gas (GHG) emissions, equal to around the current emissions from international aviation and shipping, according to some estimates. Since the waste collection and disposal facilities are not very good, most of the waste stagnates at its place of origin. This leads to hazardous materials getting disposed to the environment and causing grave danger to ecology. The Green Company Rating System recommends waste management strategies that enable businesses to identify and segregate different types of waste. The system presents guidelines on waste inventory study to enable businesses to quantify data on amount of waste generated and hence empower them to adopt suitable waste disposal strategies. The rating system also recommends waste reduction strategies. For businesses, this means that the work area is healthy and the clean surroundings present an inviting ambience for prospective

customers. The reduction of waste generation also presents an excellent business case for the organization to pursue.

e. Material Conservation, Recycling and Recyclability

Material conservation and recycling is closely related to waste management. It is self-evident that the more we conserve and recycle/ re-use the less waste we generate. Apart from this, by reusing materials there is a definite saving in costs. The cost savings is in the form of reduced material costs (as we reuse the same material) as well reduced waste disposal cost (since lesser waste is generated). The rating system promotes reuse and recycling of raw materials and discourages use of virgin materials. It even goes a step further in encouraging businesses to ensure that not only they reuse/ recycle raw materials but their product too should be recyclable/ bio-degradable.

f. Green Supply Chain

As environmental awareness among consumers increase, the demand for products with lower environmental footprint will also increase. In keeping with consumer sentiments, businesses will have to not only green their operations, but also across their supply chain.

This calls for a rethink of the business's current procurement process. Studies have shown that improved green supply chain processes mean lower waste-disposal, lower environmental impact at the vendor premises and, often, reduced materials costs. The green rating system aims to make businesses aware of these benefits to their bottom-line so that they are encouraged to implement green supply chain processes.

g. Green House Gases Reduction

The global average concentrations of various greenhouse gasses in the atmosphere reached their highest levels ever recorded, and continue increasing. The combustion of fossil fuels from human activities and land-use changes are largely responsible for the increase. The ill effects of greenhouse gases generated by the consumption of fossil fuels are very well known. The green rating system guides businesses on reducing their Green House Gas emission by setting short term goals while working on a long term strategy. The ultimate goal is to make businesses "Carbon Neutral" i.e. they should be able to remove as much carbon dioxide from the atmosphere as they generate

h. Product Stewardship

Product Stewardship is 'Extended Producer Responsibility' over the Life cycle of a product beyond production, during distribution, use and disposal of products. The rating system encourages businesses to design and develop a product that has 'Nil/Least' environmental impact (CO_2, Water, material and Toxic content) during its lifecycle. It guides businesses to perform a comprehensive analysis of all their products on environmental impacts over the lifecycle of the product and explore options for reducing such impacts.

i. Life Cycle Aspects

Several initiatives are being taken to reduce the environmental impact of products at different stages – production, distribution, use and disposal. There is a need to have an evaluation of the impact of the product throughout its life cycle, so that ultimately, only those with minimum life-cycle impact are made available. The life-cycle assessment parameters such as GHG, toxicity, material and water can guide organizations to move towards products of lower impact. The rating system facilitates in this direction.

j. Innovation

Innovation is paramount for gaining sustained competitive edge in the market. Similarly, it is the future technologies and business models, where the answer to the present environmental questions lies. Hence, it has become even more important that the company invests in innovation and imbibes a culture of strategic innovation inside the company. Through our focus on innovation, GreenCo, green company rating system helps companies focus on the technologies and models which are geared towards better environment for all. The ultimate aim of the rating system is to be as efficient as possible in the present environment with continual improvements, while keeping an eye out scouting for innovations which hold the key to a greener future.

3.1. STRATEGIC ADVANTAGES

1. Communicates the corporate commitment towards environmental sustainability to all stake holders.
2. Enhances the competitiveness of the company through resource conservation and improved efficiency
3. Current Standing- The rating system is an easy way for businesses/ companies to compare themselves against their peers or competitors
4. Businesses can use the recommendations of the rating system to develop a long term plan to improve competitiveness as well as ecologically sustainable
5. Most governments are prescribing strict environmental compliance guidelines for companies. Companies that accept the green rating system will have a 'head start' in complying with these requirements and thus have an advantage over non-complying competitors.
6. With consumer awareness related to the environment growing at a fast pace, green rated companies will enjoy considerable consumer support and goodwill.
7. Many business owners/ managers wish to adopt environmentally healthy practices but are not aware of what needs to be done. The rating

system can act as an excellent guide for such businesses.

GreenCo rating helps to drive excellence and build global competitiveness in the following areas of ecological sustainability

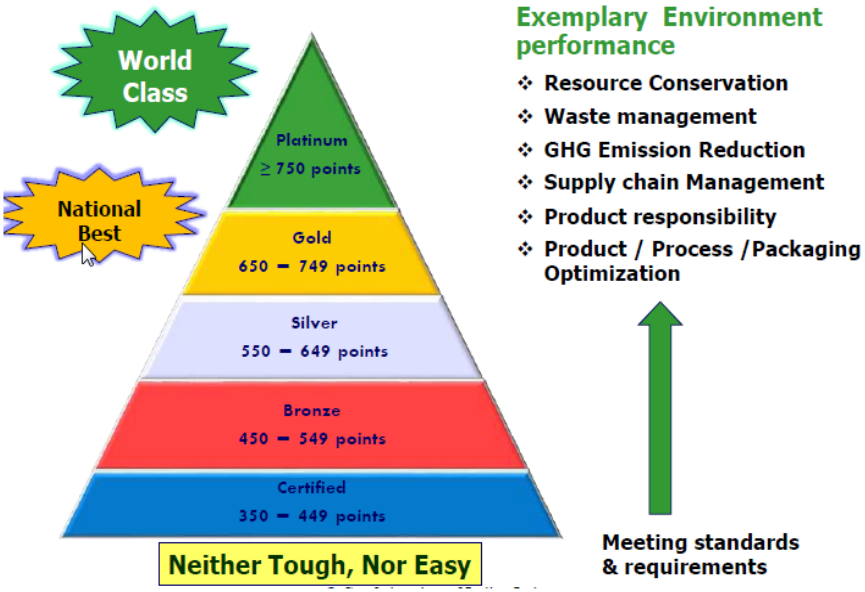
4. GREENCO CRITERIA AND LEVELS

Companies interested participating in GreenCo Certification must first register with CII Godrej GBC. Projects can be registered on CII – Godrej GBC website (www.greenco.in) under 'Green Company Rating System '. Registration is the initial step, which helps establish contact with CII – Godrej GBC and provides access to the required documents, templates, important communications and other necessary information.

Threshold criteria for certification levels are as following:

Level	Points	GreenCo Rating
Level 1	350 – 449 points	Certified
Level 2	450 – 549 points	Bronze
Level 3	550 – 649 Points	Silver
Level 4	650 – 749 Points	Gold
Level 5	> 750 points	Platinum

GreenCo Rating Levels



5.1 CRITERIA AND WEIGHTAGES

5.1.1. MANUFACTURING SECTOR

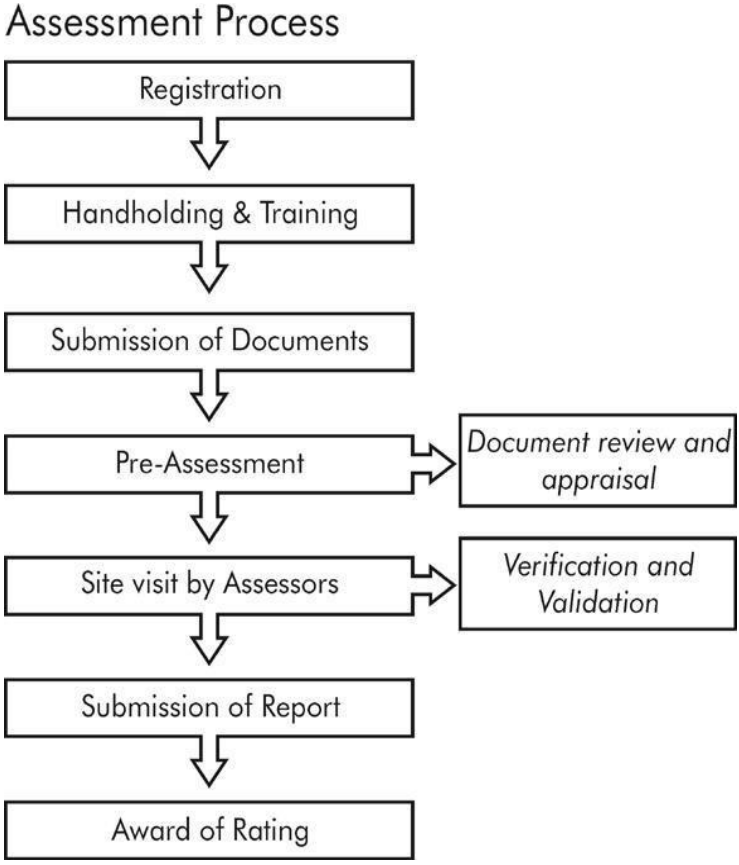
S. No	Parameters	Weightages
	(Points)	
1	Energy Efficiency	150
2	Water Conservation	100
3	Renewable Energy	100
4	GHG Emission Reduction	100
5	Waste Management	100
6	Material Conservation, Recycling & Recyclables	100
7	Green Supply Chain	100
8	Product Stewardship & Life Cycle Aspects	125
9	Innovation for Environment	50
10	Green Infrastructure & Ecology	75
Total	**1000**	

5.1.2. SERVICE SECTOR

S. No	Parameters	Weightages
(Points)		
1	Energy Efficiency	150
2	Water Conservation	100
3	Renewable Energy	100
4	GHG Emission Reduction	100
5	Waste Management	100
6	Material Conservation, Recycling & Recyclables	75
7	Green Supply Chain	75
8	Innovation for Environment	50
9	Green Infrastructure & Ecology	75
Total		**825**

6. ASSESSMENT PROCESS

Subsequent to the registration, the CII team will communicate with the plant team to explain the detailed process of the assessment. The various steps involved in the assessment process are detailed as under.



UNIT-6

INTERNATIONAL STANDARD ISO 3834-2:2005(E) FOR WELDING

1 Scope

This part of ISO 3834 defines comprehensive quality requirements for fusion welding of metallic materials both
in workshops and at field installation sites.

2 Normative references

ISO 3834-1, Quality requirements for fusion welding of metallic materials — Part 1: Criteria for the selection of the appropriate level of quality requirements

ISO 3834-5:2005, Quality requirements for fusion welding of metallic materials — Part 5: Documents with which it is necessary to conform to claim conformity to the quality requirements of ISO 3834-2, ISO 3834-3 or ISO 3834-4

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3834-1 apply.

4 Use of this part of ISO 3834

For general information on the use of this part of ISO 3834, ISO 3834-1 shall be used. In order to fulfil the quality requirements given in this part of ISO 3834, the

conformity to relevant documents given in ISO 3834-5 shall be verified. In certain situations, e.g. where manufacturing is more suited to ISO 3834-3 or ISO 3834-4, or where particular operations, such as heat treatment, are not undertaken, the requirements detailed in this part of ISO 3834 may be selectively amended or deleted. Otherwise, the requirements contained within this part of ISO 3834 shall be adopted in full.

ISO 3834-2:2005(E)

5 Review of requirements and technical review

5.1 General

The manufacturer shall review the contractual requirements and any other requirements, together with any technical data provided by the purchaser or in-house data when the construction is designed by the manufacturer. The manufacturer shall establish that all information necessary to carry out the manufacturing operations is complete and available prior to the commencement of the work. The manufacturer shall affirm its capability to meet all requirements and shall ensure adequate planning of all quality-related activities. The review of requirements is carried out by the manufacturer to verify that the work content is within its capability to perform, that sufficient resources are available to achieve delivery schedules and that documentation is clear and unambiguous. The

manufacturer shall ensure that any variations between the contract and any previous quotation are identified and the purchaser notified of any programme, cost or engineering changes that may result. Items in 5.2 are typically considered at or before the time of the review of requirements review. Items in 5.3 usually form part of the technical review and are considered during the initial planning stage. When a contract does not exist, e.g. items made for stock, the manufacturer is required to take into consideration the requirements of 5.2 while carrying out the technical review (see 5.3).

5.2 Review of requirements

Aspects to be considered shall include the following:

a) the product standard to be used, together with anysupplementary requirements;
b) statutory and regulatory requirements;
c) any additional requirement determined by the manufacturer;
d) the capability of the manufacturer to meet the prescribed requirements.

5.3 Technical review

Technical requirements to be considered shall include the following:

a) parent material(s) specification and welded joint properties;
b) quality and acceptance requirements for welds;

c) location, accessibility and sequence of welds, including accessibility for inspection and for non-destructive testing;
d) the specification of welding procedures, non-destructive testing procedures and heat-treatment procedures;
e) the approach to be used for the qualification of welding procedures ;
f) the qualification of personnel;
g) selection, identification and/or traceability (e.g. for materials, welds);
h) quality-control arrangements, including any involvement of an independent inspection body;
i) inspection and testing;
j) sub-contracting;
k) post-weld heat treatment;
l) other welding requirements, e.g. batch testing of consumables, ferrite content of weld metal, ageing, hydrogen content, permanent backing, use of peening, surface finish, weld profile;
m) use of special methods (e.g. to achieve full penetration without backing when welded from one side only);
n) dimensions and details of joint preparation and completed weld;
o) welds which are to be made in the workshop, or elsewhere;
p) environmental conditions relevant to the application of the process (e.g. very low-

temperature ambient conditions or any necessity to provide protection against adverse weather conditions);

q) handling of non-conformances.

6 Sub-contracting

When a manufacturer intends to use sub-contracted services or activities (e.g. welding, inspection, non-destructive testing, heat treatment), information necessary to meet applicable requirements shall be supplied by the manufacturer to the sub-contractor. The sub-contractor shall provide such records and documentation of his work as may be specified by the manufacturer. A sub-contractor shall work under the order and responsibility of the manufacturer and shall fully comply with the relevant requirements of this part of ISO 3834. The manufacturer shall ensure that the sub-contractor can comply with the quality requirements as specified. The information to be provided by the manufacturer to the sub-contractor shall include all relevant data from the review of requirements (see 5.2) and the technical review (see 5.3). Additional requirements may be specified as necessary to assure sub-contractor compliance with technical requirements.

7 Welding personnel

7.1 General

The manufacturer shall have at his disposal sufficient and competent personnel for the planning, performing and supervising of the welding production according to specified requirements.

7.2 Welders and welding operators

Welders and welding operators shall be qualified by an appropriate test. The ISO documents to which it is required to conform to fulfil the quality requirements are specified in ISO 3834-5:2005, Table 1, for arc welding, electron beam welding, laser beam welding and gas welding, and in ISO 3834-5:2005, Table 10, for other fusion welding processes.

7.3 Welding coordination personnel

The manufacturer shall have at his disposal appropriate welding coordination personnel. Such persons having responsibility for quality activities shall have sufficient authority to enable any necessary action to be taken. The tasks and responsibilities of such persons shall be clearly defined. The ISO documents to which it is required to conform to fulfil the quality requirements are specified in ISO 3834-5:2005, Table 2, for arc welding, electron beam welding, laser beam welding and gas welding, and in ISO 3834-5:2005, Table 10, for other fusion welding processes.

8 Inspection and testing personnel

8.1 General

The manufacturer shall have at his disposal sufficient and competent personnel for planning, performing, and supervising the inspection and testing of the welding production according to specified requirements.

8.2 Non-destructive testing personnel

The non-destructive testing personnel shall be qualified. For visual testing, a qualification test may not be required. When a qualification test is not required, competence shall be verified by the manufacturer. The ISO documents to which it is required to conform to fulfil the quality requirements are specified in ISO 3834-5:2005, Table 3, for arc welding, electron beam welding, laser beam welding and gas welding, and in ISO 3834-5:2005, Table 10, for other fusion welding processes.

9 Equipment

9.1 Production and testing equipment

The following equipment shall be available, when necessary:

- power sources and other machines;
- equipment for joint and surface preparation and for cutting, including thermal cutting;
- equipment for preheating and post-heat treatment including temperature indicator;
- jigs and fixtures;
- cranes and handling equipment used for the production;
- personal protective equipment and other safety equipment, directly associated with the applicable manufacturing process;
- ovens, quivers, etc. used for treatment of welding consumables;

- facilities for surface cleaning;
- destructive and non-destructive testing facilities.

9.2 Description of equipment

The manufacturer shall maintain a list of essential equipment, used for the production. This list shall identify items of major equipment, essential for an evaluation of workshop capacity and capability. This includes, for example:

- maximum capacity of crane(s);
- size of components that the workshop is able to handle;
- capability of mechanised or automatic welding equipment;
- dimensions and maximum temperature of furnaces for post-weld heat treatment;
- capacities of rolling, bending and cutting equipment.

Other equipment only needs to be specified by approximate total numbers which cover each general type (e.g. total number of power sources for the different processes).

9.3 Suitability of equipment

The equipment shall be adequate for the application concerned.

NOTE - Qualification of the welding and heating equipment is not normally required unless otherwise specified.

9.4 New equipment

After installation of new (or refurbished) equipment, appropriate tests of the equipment shall be performed. The tests shall verify the correct function of the equipment. The tests shall be carried out and documented in accordance with appropriate standards, whenever relevant.

9.5 Equipment maintenance

The manufacturer shall have documented plans for the maintenance of equipment. The plan shall ensure maintenance checks of those items in the equipment which control variables listed in the relevant procedure specifications. The plans may be limited to those items which are essential for assuring the quality of the product.

Examples of these items are as follows:

- condition of guides in equipment for thermal cutting, mechanised fixtures etc.;
- condition of ammeters and voltmeters, flow meters etc. used for the operation of the welding equipment;
- condition of cables, hoses, connectors, etc.;
- condition of control system in mechanised and/or automatic welding unit;
- condition of temperature-measurement instruments;
- condition of wire feeders and conduits.

Defective equipment shall not be used.

10 Welding and related activities

10.1 Production planning

The manufacturer shall carry out adequate production planning.

Items to be considered shall include at least:

- specification of the sequence by which the construction shall be manufactured (e.g. as single parts or sub-assemblies, and the order of subsequent final assembly);
- identification of the individual processes required to manufacture the construction;
- reference to the appropriate procedure specifications for welding and allied processes;
- sequence in which the welds are to be made;
- order and timing in which the individual processes are to be performed;
- specification for inspection and testing, including the involvement of any independent inspection body;
- environmental conditions (e.g. protection from wind and rain);
- identification by batches, components or parts, as appropriate;
- allocation of qualified personnel;
- arrangement for any production test.

10.2 Welding-procedure specifications

The manufacturer shall prepare the welding-procedure specification(s) and shall ensure that these are used correctly in production.

The ISO documents to which it is required to conform to fulfil the quality requirements are specified in ISO 3834-5:2005, Table 4, for arc welding, electron beam welding, laser beam welding and gas welding, and in ISO 3834-5:2005, Table 10, for other fusion welding processes.

10.3 Qualification of the welding procedures

Welding procedures shall be qualified prior to production. The method of qualification shall be in accordance with relevant product standards or as stated in the specification. The ISO documents to which it is required to conform to fulfil the quality requirements are specified in ISO 3834-5:2005, Table 5, for arc welding, electron beam welding, laser beam welding and gas welding, and in ISO 3834-5:2005, Table 10, for other fusion welding processes.

NOTE - Qualification of other procedures may be required in the relevant product standards and/or the specification(s).

10.4 Work instructions

The manufacturer may use the welding-procedure specification directly for instruction purposes. Alternatively, dedicated work instructions may be used.

Such dedicated work instructions shall be prepared from a qualified welding-procedure specification and do not require separate qualification.

10.5 Procedures for preparation and control of documents

The manufacturer shall establish and maintain procedures for the preparation and control of relevant quality documents (e.g. welding-procedure specification, welding-procedure qualification record, welders and welding-operators qualification certificates).

11 Welding consumables

11.1 General

Responsibilities and procedures for control of welding consumables shall be specified.

11.2 Batch testing

Batch testing of welding consumables shall be required only if specified.

11.3 Storage and handling

The manufacturer shall produce and implement procedures for storage, handling, identification and use of welding consumables which avoid moisture pick-up, oxidation, damage, etc. The procedures shall be in accordance with the supplier‘s recommendations.

12 Storage of parent materials

Storage shall be such that the material, including material supplied by the client, will not be adversely affected. Identification shall be maintained during storage.

13 Post-weld heat treatment

The manufacturer shall be fully responsible for the specification and the performance of any post-weld heat treatment. The procedure shall be compatible with the parent material, welded joint, construction, etc. and shall be in accordance with the product standard and/or specified requirements. A record of the heat treatment shall be made during the process. The record shall demonstrate that the specification has been followed and shall be traceable to the particular product. The ISO documents to which it is required to conform to fulfil the quality requirements are specified in ISO 3834-5:2005, Table 6, for arc welding, electron beam welding, laser beam welding and gas welding, and in ISO 3834-5:2005, Table 10, for other fusion welding processes.

14 Inspection and testing

14.1 General

Applicable inspections and tests shall be implemented at appropriate points in the manufacturing process to assure conformity with contract requirements. Location and frequency of such inspections and/or tests

will depend on the contract and/or product standard, the welding process and the type of construction (see 5.2 and 5.3).

NOTE - The manufacturer may carry out additional tests without restriction. Reporting of such tests is not required.

14.2 Inspection and testing before welding

Before the start of welding, the following shall be checked:

- suitability and validity of welders' and welding operators' qualification certificates;
- suitability of welding-procedure specification;
- identity of parent material;
- identity of welding consumables;
- joint preparation (e.g. shape and dimensions);
- fit-up, jigging and tacking;
- any special requirements in the welding-procedure specification (e.g. prevention of distortion);
- suitability of working conditions for welding, including environment.

14.3 Inspection and testing during welding

During welding, the following shall be checked at suitable intervals or by continuous monitoring:

- essential welding parameters (e.g. welding current, arc voltage and travel speed);
- preheating/interpass temperature;

- cleaning and shape of runs and layers of weld metal;
- back gouging;
- welding sequence;
- correct use and handling of welding consumables;
- control of distortion;
- any intermediate examination (e.g. checking of dimensions).

The ISO documents to which it is required to conform to fulfil the quality requirements are specified in ISO 3834-5:2005, Table 7, for arc welding, electron beam welding, laser beam welding and gas welding, and in ISO 3834-5:2005, Table 10, for other fusion welding processes.

14.4 Inspection and testing after welding

After welding, the compliance with relevant acceptance criteria shall be checked:

- by visual inspection;
- by non-destructive testing;
- by destructive testing;
- form, shape and dimensions of the construction;
- results and records of post-weld operations (e.g. post-weld heat treatment, ageing).

The ISO documents to which it is required to conform to fulfil the quality requirements are specified in ISO 3834-5:2005, Table 8, for arc welding, electron beam welding, laser beam welding and gas welding, and

in ISO 3834-5:2005, Table 10, for other fusion welding processes.

14.5 Inspection and test status

Measures shall be taken, as appropriate, to indicate, e.g. by marking of the item or a routing card, the status of inspection and test of the welded construction.

15 Non-conformance and corrective actions

Measures shall be implemented to control items or activities which do not conform to specified requirements in order to prevent their inadvertent acceptance. When repair and/or rectification is undertaken by the manufacturer, descriptions of appropriate procedures shall be available at all workstations where repair or rectification is performed. When repair is carried out, the items shall be re-inspected, tested and examined in accordance with the original requirements. Measures shall also be implemented to avoid recurrence of non-conformances.

16 Calibration and validation of measuring, inspection and testing equipment

The manufacturer shall be responsible for the appropriate calibration or validation of measuring, inspection and testing equipment. All equipment used to assess the quality of the construction shall be suitably controlled and shall be calibrated or validated at specified intervals. The ISO documents to which it is

required to conform to fulfil the quality requirements are specified in ISO 3834-5:2005, Table 9, for arc welding, electron beam welding, laser beam welding and gas welding, and in ISO 3834-5:2005, Table 10, for other fusion welding processes.

17 Identification and traceability

Identification and traceability shall be maintained throughout the manufacturing process, if required. Documented systems to ensure identification and traceability of the welding operations shall include, if required:

- identification of production plans;
- identification of routing cards;
- identification of weld locations in construction;
- identification of non-destructive testing procedures and personnel;
- identification of welding consumable (e.g. designation, trade name, manufacturer of consumables and batch or cast numbers);
- identification and/or traceability of parent material (e.g. type, cast number);
- identification of location of repairs;
- identification of location of temporary attachments;
- traceability for fully mechanised and automatic welding units to specific welds;
- traceability of welder and welding operators to specific welds;

- traceability of welding-procedure specifications to specific welds.

18 Quality records

Quality records shall include, when applicable:

- record of requirement/technical review;
- material inspection documents;
- welding consumable inspection documents;
- welding-procedure specifications;
- equipment maintenance records;
- welding-procedure qualification records (WPQR);
- welder or welding-operator qualification certificates;
- production plan;
- non-destructive testing personnel certificates;
- heat-treatment procedure specification and records;
- non-destructive testing and destructive testing procedures and reports;
- dimensional reports;
- records of repairs and non-conformance reports;
- other documents, if required.

Quality records shall be retained for a minimum period of five years in the absence of any other specified requirements.

UNIT-7

5S

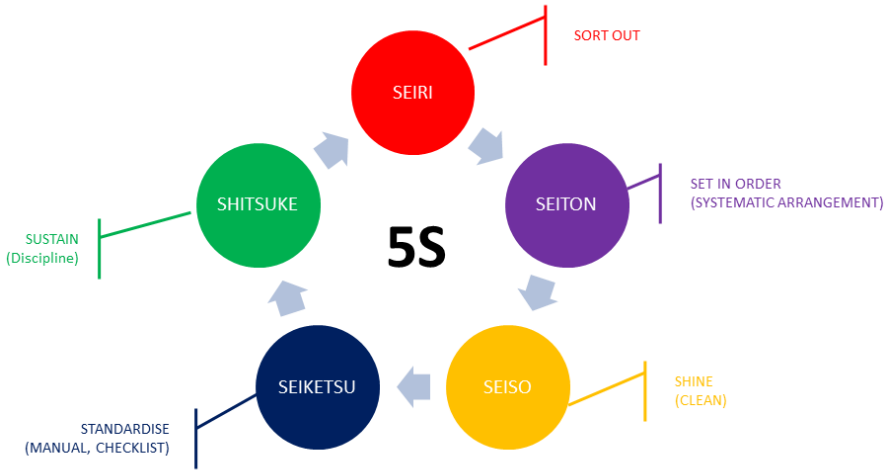
5S is a concept born from LEAN manufacturing. LEAN is outcome of Toyota Production System (TPS). Lean means - Making process fast and efficient through Waste Reduction.

Henry Ford first perfected flow production in the early part of the 20th Century.

Toyota improved Ford's design in the 30s and 40s developing its LEAN production system to be more adaptive to needs and changes.

It is based on "Order & Structure". It was required to ensure the sustainability of the "Visual Factory" concept.

5S uses a list of five Japanese words:



- Seiri,
- Seiton,
- Seiso,
- Seiketsu,and
- Shitsuke.

These are five 5S phases, which can be translated into English as as:

- Sort out,
- Set in order,
- Shine,
- Standardize, and
- Sustain

5S describes how to organize a work space for efficiency and effectiveness by identifying, storing the items, maintaining the area, standardising and sustaining the same.

5S is frequently known as visual control, visual workplace, or visual factory.

5S was developed in Japan and was identified as one of the techniques that enabled Just in
Time manufacturing.

Benefits of 5S:

- It supports SAFETY initiatives of the organisation
- People feel better about their work area and take pride and ownership in the results. (Looks better, feels better)
- Provides Visual Organization
- Promotes & supports discipline in the work place.
- Eliminates the WASTE resulting from disorganization.
- Helps to eliminate duplication of unwanted/un-needed materials.
- It is a catalyst for Continuous Improvement in an organisation

CHECK LIST FOR 5S AUDIT

5S Internal Audit Checklist				5S Zone: Auditee:	
SL	**Stage**	**Clause no.**	**Guideliness**	**Responsibility**	**Rating (0,1,2,3,4)**
1	Sort out	1.1	Distinguish between what is needed and not needed (red tag and green tag)	Employees	
		1.2	Unneeded equipment, tools, furniture etc should not be present in the work place	Employees	
		1.3	Dust Bins should not be full	Team leader	
		1.4	Unneeded items on walls, bulletin boards etc. should not be present	Employees	
		1.5	Items on aisles, stair ways, corners etc. should not be present	Employees	
		1.6	Safety Hazards (water, oils, chemical, machine) should not exit	Employees	
		1.7	Unneeded inventory, supplies, arts, or materials should not be present	Team leader	
2	Set in Order	2.1	A place of everything and everything is in its place	Team leader	
		2.2	Aisles, workstations, equipment locations, bins are indicated	Team leader	
		2.3	Materials are kept in order	Employees	
		2.4	All quantities and limits are easily recognisable	Team leader	
		2.5	Items should be recognisable within 30 seconds	Employees	
		2.6	FIFO is maintained	Employees	
3	Shine	3.1	Cleaning schedules with responsibilities are defined for (1) work place (2) work stations (3) storing cabinets (4) machines (5) tools (6) rest rooms and so on.	Team leader	
		3.2	Floors are free from, dirt, oil and grease	Employees	
		3.3	Walls are free from, dirt, oil and grease	Employees	
		3.4	Stairs are free from, dirt, oil and grease	Employees	
		3.5	Equipment is kept clean and free form dirt, oil and grease.	Employees	
		3.6	Cleaning materials are easily accessible.	Team leader	
		3.7	Labels, Boards are kept clean and unbroken	Team leader	
		3.8	Color marking are kept clean and unbroken	Team leader	
4	Standardisation	4.1	All required standards, procedures & instructions are known, visible and easily approachable.	Team leader	
		4.2	Cleaning checklists are displayed at desired locations and easily approachable	Team leader	
		4.3	Inventory level (Minimum/ Maximum) is defined	Team leader	
5	Sustain	5.1	All employees are trained on and aware of 5-S	Team leader	
Signature: Name of 5S Auditor: Date:				Total	
				Maximum Marks	100
				5S Rating (%)	

Note: This checklist dully filled and signed must be handed over to the Management/ 5S Coordinator on the same day of the audit closing meeting.