


YOKOGAWA 	DOCUMENT NUMBER: SNW-QM-101
DOCUMENT TITLE: Quality Management System for Industrial Automation Projects (Solutions)	

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1 Contents

1	Contents	2
2	Distribution	2
3	Introduction	3
4	References	3
4.1	External	3
4.2	Internal	3
5	Abbreviations	3
6	Quality Management System	4
6.1	General Requirements	4
6.2	Documentation Requirements	4
7	Management Responsibility	5
7.1	Management Commitment	5
7.2	Customer focus	6
7.3	Quality Policy.....	6
7.4	Planning	6
7.5	Responsibility, Authority and Communication	6
7.6	Management Review	7
8	Resource Management	7
8.1	Provision of resources	7
8.2	Human Resources	7
8.3	Infrastructure	8
8.4	Work Environment	8
9	Product Realization	8
9.1	Planning for Product Realization.....	8
9.2	Customer-related Processes	8
9.3	Design and Development	9
9.4	Purchasing	13
9.5	Production and Service Provision	14
9.6	Control of Monitoring and Measuring Devices	14
10	Measurement, Analysis and Improvement	15
10.1	General.....	15
10.2	Monitoring and Measurements	15
10.3	Control of Nonconforming Product.....	15
10.4	Analysis of Data.....	16
10.5	Improvement	16
11	End of document	16

2 Distribution

This document is issued to client for information.

3 Introduction

Yokogawa Electric International Pte Ltd (YEI) is an ISO 9001:2008 certified company. The scope of certification covers sales, project management, application engineering, integration and after sales servicing of process analyzer systems.

YEI has a comprehensive Quality Management System based on the ISO 9001:2008 standard.

Yokogawa Engineering Asia Pte Ltd (YEA) is affiliated to YEI & YEA is also certified to the ISO14001:2004 Environmental Management System.

Both these accreditations are awarded by Lloyds Register of Quality Assurance.

4 References

4.1 External

Document	Title
ISO9000:2005	Quality Management System – Fundamentals and Vocabulary
ISO9001:2008	Quality Management System - Requirements
ISO9004-1:2000	Quality Management System – Guidelines for performance improvement

4.2 Internal

Document	Title
SNW-EM-301	Solutions Engineering Workflow
SEW-YD-001	Functional Safety Management Policy
SLW-B-001-024	YEA Quality Manual

5 Abbreviations

Abbreviation	Meaning
EM	Engineering Manager
FOB	Free-On-Board
CAR	Corrective Action Request
FAT	Factory Acceptance Test
FSM	Functional Safety Management
IFAT	Integrated Factory Acceptance Test
IQA	Internal Quality Audit
ITP	Inspection and Test Plan
KOM	Kick-Off-Meeting
LPE	Lead Project Engineer
LSE	Lead System Engineer
LSSE	Lead Safety System Engineer
PD	Panel Department
PEP	Project Execution Plan
PM	Project Manager
PO	Purchase Order
PQP	Project Quality Plan
PSC	Process Solutions Center
QC	Quality Control
QM	Quality Manager
QMS	Quality Management System
SAT	Site Acceptance Test
SEC	YEA Safety Engineering Center
SIC	System Integration Centre, a division of Engineering Operations at YEA
YEA	Yokogawa Engineering Asia Pte Ltd, Singapore
YHQ	Yokogawa Electric Corporation, Tokyo, Japan
YEI	Yokogawa Electric International Pte Ltd.

6 Quality Management System

6.1 General Requirements

The scope of work for a project is defined in the contract between YEI and the Client, in the KOM minutes and in various technical clarification correspondences.

The general requirements of the project scope include:

- Project Management
- Engineering & Design
- Procurement and Supply of Materials and Equipment

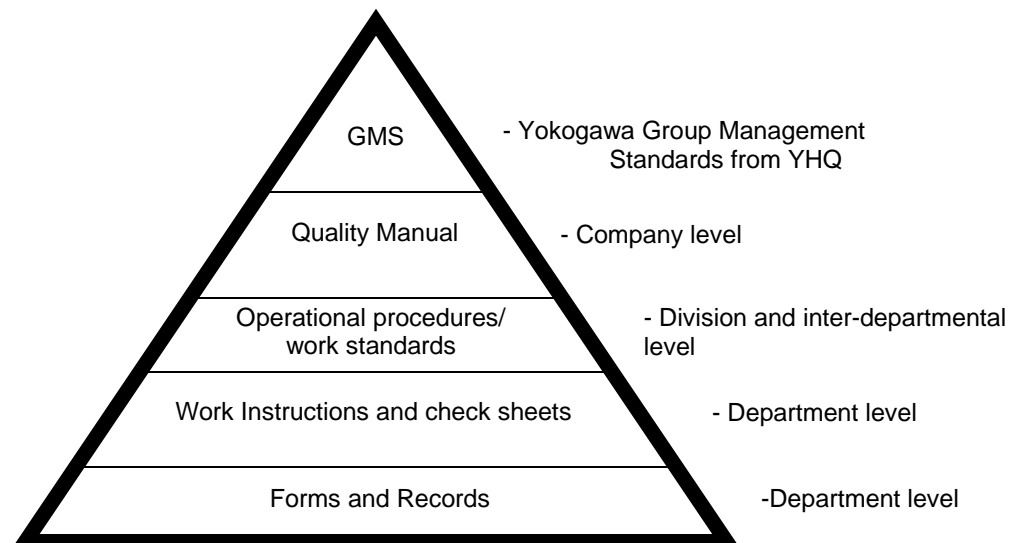
Work is completed to drawings and specifications as listed on the Project Document Register and as described in the PEP and this PQP.

Completed work are inspected and tested internally by YEI. In addition, completed work shall be factory tested and site tested with the Client. Test Records are maintained that document the results of all test activities.

6.2 Documentation Requirements

6.2.1 General

Yokogawa documentation structure is categorized as follows:



6.2.2 Quality Manual

YEI has a comprehensive Quality Manual established in accordance with ISO9001:2008 requirements and is approved for issue by the management of YEI/YEA. This document is an overview of the Quality Management System and practices adopted by YEI for implementation of Industrial Automation Projects.

6.2.3 Control of Documents

A Project Documentation Register is maintained as per YEI standard requirement. This is the basis of control of all documents.

All documents are reviewed and approved by the authorized personnel prior to release to the necessary locations.

All YEI documents are stored in the Engineering Server at YEI. This server has a disaster recovery system conforming to YEI/YEA standard.

The following are controlled documents:

- Client's Contract Documents
- Client's Specifications
- Client's design inputs, including drawings and narratives.
- PEP
- PQP
- Design Documents
- FAT Procedures
- Change Control documentation (including Client's change orders)

The PM and LPE ensure that all documents pertinent to the execution of the contract are issued to the appropriate personnel.

All project documentation received or generated by YEI are maintained in the Project Folder. The Project Folder is indexed in the Project Document Register. This is to facilitate identification and traceability of all documents.

6.2.4 Control of Records

Quality records are documentary evidence of quality assurance activities.

Quality records are used to demonstrate:

- Attainment of specific quality requirements
- Effective operation of the quality management system

The following documents constitute QC records for the project, where applicable:

- Completed PM(S) milestone checks, Project Management milestone checks
- Completed PE(S) milestone checks, Project Engineering milestone checks
- Completed SN milestone checks, Solutions Engineering milestone checks
- Internal test records for all systems in the project.
- Internal punch list
- FAT/IFAT records for all systems in the project.
- FAT/IFAT punch list
- SAT records for all systems in the project.
- SAT punch list
- CAR for problems encountered
- Internal Audit Reports
- Customer satisfaction survey reports
- Project FOB close out report
- Project close out report

Project QC records are retained at YEI in accordance with its document retention policy.

7 Management Responsibility

7.1 Management Commitment

YEI top management and the PM for this project are committed to the successful outcome of this project. This commitment is manifest in the PEP and this PQP drafted for this project.

YEI PM is committed to the continued suitability and effectiveness of the project management systems as outlined in this PQP. YEI PM is committed to deliver the best products and services that will meet the terms of the contract.

All YEI clients are important. YEI is committed to deliver products and services that ensure safety, reliability and value throughout this project and for all its Clients.

7.2 Customer focus

YEI is an engineering company focused on understanding the needs of its Client and aims to enhance customer satisfaction by fulfilling those needs.

7.3 Quality Policy

The foundation of customer satisfaction is through implementation of QMS. We are committed in meeting requirements and continually improve the effectiveness of the QMS during execution of Industrial Automation Projects.

As such, we firmly believe in our policy of "QUALITY FIRST".

The quality policy is communicated and understood within the organization.

7.4 Planning

7.4.1 Quality Objectives

The general quality objectives of projects are to meet the requirements of the Client and to ensure on-time delivery of the system.

The project team, guided by the PM, is responsible for realizing the quality objectives.

7.4.2 QMS Planning

YEI has developed and executes the QMS as described in the PQP.

7.5 Responsibility, Authority and Communication

The project organization chart is defined and listed in the Project Documentation Register. This shows reporting route and scope of responsibilities of all staff in this project.

Job descriptions of each member of the project are described in the PEP.

Communication Protocols are defined in the PEP.

YEI may communicate informally without restriction with the Client and Suppliers. Any informal discussion shall not have any contractual obligation until confirmed in formal correspondence by the Project Representative.

Formal correspondence includes:

- Meetings minutes
- Monthly Reports, Weekly Reports, Other Reports

- Correspondence (Letters, Faxes)
- Testing Records, Punch Lists
- Change Orders
- Requests for information (RFI)

7.6 Management Review

7.6.1 General

The PM together with the LPE and other project staffs carry out regular walk through reviews of project performance and initiate corrective actions whenever necessary. Reviews are documented by the PM or his nominee. The minutes are not exhaustive but reflect actions for the items discussed. This system of reviews is an efficient internal communication channel for project issues.

Top Management annually reviews the health of the QMS at Management Review meetings. These Management Reviews examine the continuing suitability, adequacy and effectiveness of the QMS by evaluating the aspects listed in the review input. Management Review occurs at the Engineering Operations level and does not occur at the project level.

7.6.2 Review Input

The Management Review will consider the following inputs:

- Results of audits
- Customer Feedback
- Process performance and product conformity
- Status of preventive and corrective actions
- Follow-up actions from previous management reviews
- Changes that could affect the QMS
- Recommendations for improvement

7.6.3 Review Output

The output of the Management Review includes actions and decisions related to:

- Improvement of the effectiveness of the quality management system and its processes
- Improvement of product related to customer requirements
- Resource needs of the organization

8 Resource Management

8.1 Provision of resources

YEI Top Management and YEI PM are responsible for ensuring that adequate infrastructure facilities, equipment and trained personnel are assigned to the project leading to the effective and efficient completion of the project.

8.2 Human Resources

8.2.1 General

All Engineering, Supervisory and Quality staff are evaluated and approved by the YEI PM, prior to commencement of work.

The project team is assembled from members of different departments that handle the respective functional disciplines for the project.

The staff selection process ensures that all members of the project are suitably trained and adequately qualified to perform the required design and engineering activities.

8.2.2 Competence, awareness and training

YEI has clear guidelines on the competence for personnel performing work which affects product quality.

Where external resources are required on a temporary or casual basis, the PM ensures that these additional resources are trained in all relevant company processes. Evidence of staff qualification is available in their personnel file.

A staff may be accepted for the project if training will be scheduled to give him the competence for assigned tasks which are to be carried out later in the project.

8.3 Infrastructure

The PM determines, provides and ensures the maintenance of infrastructure needed to achieve conformity to project requirements. This includes workspace and associated utilities, process equipment and supporting services such as transport, communication or information systems. The PM is supported by YEI management in this.

8.4 Work Environment

The PM manages the work environment needed to achieve conformity to product requirement. The PM is supported by YEI management in this.

9 Product Realization

9.1 Planning for Product Realization

The Client specifications and the functional specifications for the project are the basis for planning the activities in the project. The PM and his team of Lead Engineers develop the work breakdown structure and plan the detailed execution of the project.

The main phases of a typical project include:

- Initiation and planning
- Execution - Basic design
- Execution - Detail design
- Execution - Implementation
- Execution - Internal Testing
- Execution - Acceptance Testing
- FOB Close out and Shipment
- Site Execution and Acceptance Test
- Final Close Out and As-Built Documentation

9.2 Customer-related Processes

9.2.1 Determination of Requirements Related to the Products

The review of customer requirements is done at two stages:

- At project tender phase

- Upon award of the contract

At the project tender phase, the sales team checks that all requirements of the specifications can be met. A proposal is prepared for bidding and deviations or enhancements over the tender requirements are clearly described in a clarification list to the Client.

Upon award of the contract, the sales team and the engineering team check that the customer's contract specifications, commercial terms, bill of materials, scope of work, delivery dates, post-delivery activities etc, are clearly defined and can be met. Post-delivery activities include, for example, actions under warranty provisions, contractual obligations such as maintenance services, and supplementary services such as recycling or final disposition.

The PM undertakes a detailed contract review when accepting the project from Sales Division. The scopes of work and contract deviations are carefully understood.

A project KOM with the Client is held to confirm or clarify project requirements and to resolve issues.

9.2.2 Review of the Requirements Related to the Product

The PM will advise the Client of any discrepancies or outstanding requirements identified during review of documents issued prior to commencement of design activities. Details of such reviews (correspondence, minutes etc.) are maintained in accordance with the documentation practice for this project.

Should amendments, changes or variations be proposed during the project, the PM initiates internal review to ensure that:

- The change requirements are adequately defined and documented
- YEI has the capability to meet the change requirements
- The changes are reflected in program, quality and financial agreements.

Any variation to the contract is reviewed by the PM, and other project staff with appropriate technical knowledge, for the following:

- That the variations have clearly defined technical and quality requirements
- That the project has the necessary resources, organization and facilities to perform its obligations under the terms of the variation

Upon completion of the variation review, the PM issues to all concerned parties a variation notice that details the variation requirements.

A register of contract variations is established and maintained by the PM.

9.2.3 Customer Communication

All matters pertaining to communication route and modes of communication with the Client are covered in the PEP. This includes communication in relation to product information, enquires, contract handling, contract amendments and Client complaints.

The QM together with a line manager carries out a Customer Satisfaction Survey interview at the end of FAT/IFAT.

9.3 Design and Development

9.3.1 Design and Development Planning

At project kickoff, the PM and the project team, consider the following:

- Project scope and schedule
- List of Client input data required for this project
- Applicable specifications, standards and codes
- Identification and implementation of any QC process, equipment and resources required for effective quality control of the deliverables
- Requirements for design and inspection documentation
- Requirements for issue of design and design change control

If any incomplete, ambiguous or conflicting requirements are noted, these are resolved with the customer at the project KOM and at subsequent technical clarification meetings or simply by fax, email or telephone.

Design control is intended to ensure that design activities involving preparation, receipt, maintenance, control, distribution, revision and approval are completed and verified in accordance with the contract and code requirements, and that design activities are performed by suitably qualified personnel.

Tasks and responsibilities for design activities are detailed in the YEI Engineering Manual.

The PM ensures that all Client requirements are relayed to relevant internal staff and suppliers.

Design review meetings are conducted at appropriate phases in the design process. These review meetings also ensure that design changes are identified and controlled in accordance with the requirements of the PEP.

The LPEs ensure that any design nonconformities are logged in the design review and duly resolved and closed.

9.3.2 Design and Development Inputs

Prior to commencing the design phase, the PM reviews the contract scope to identify engineering input requirements for the project. The PM communicates these engineering input requirements to the Client at KOM or other technical meeting.

The project team tracks all engineering design inputs, including new revisions, furnished by the Client. The LPE and LSE shall review all engineering design input for correctness before distribution for implementation to appropriate engineers in the project team.

9.3.3 Design and Development Outputs

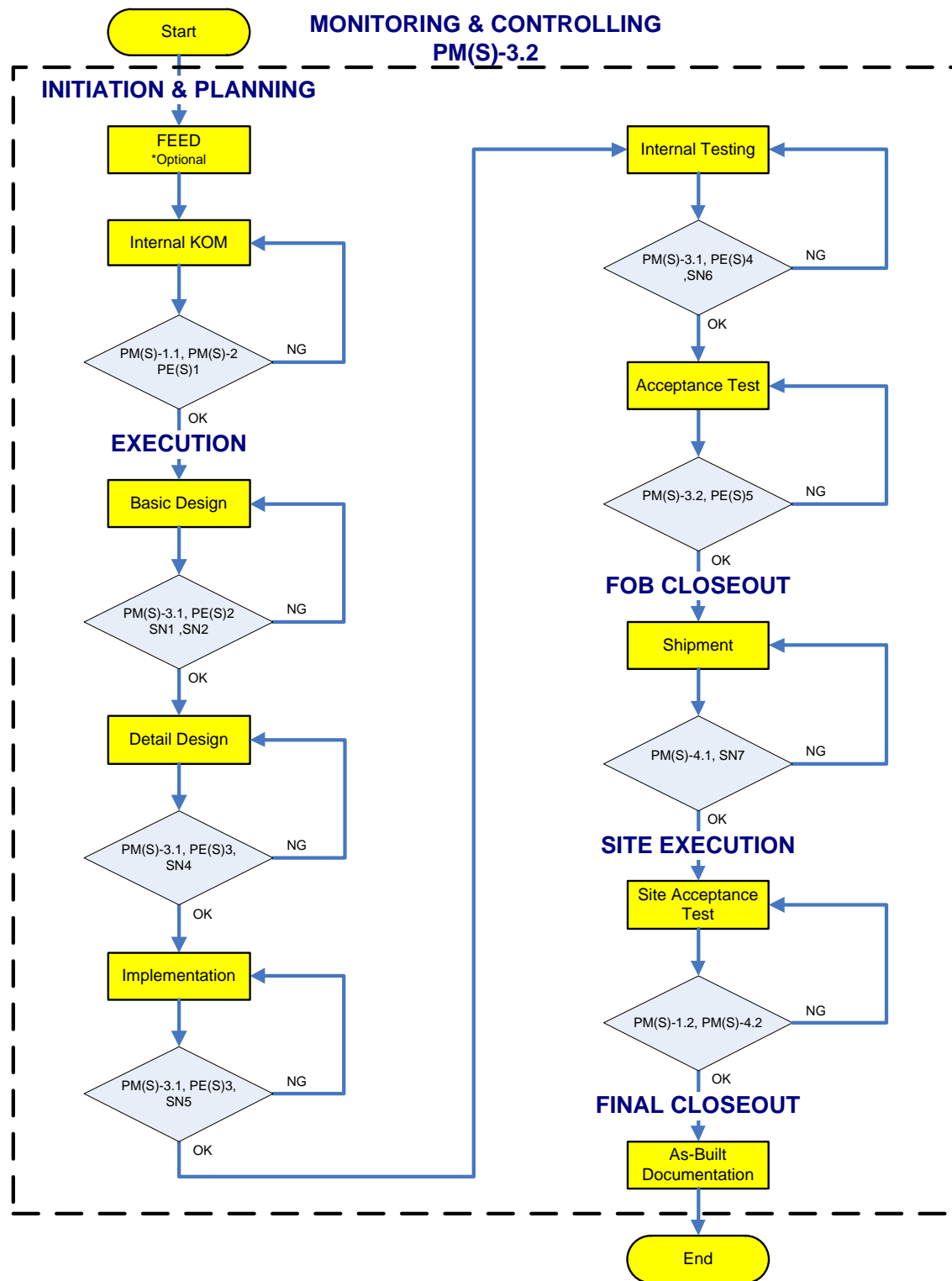
Design practices and processes shall be reviewed at IQA to ensure that design of the system is proceeding under controlled conditions.

9.3.4 Design and Development Review

Engineering design reviews are checked by competent individuals other than those performing the actual design. Evidence of review and internal approval are maintained for all design drawings.

A responsibility matrix is maintained by the PM to indicate the persons responsible for review and approval of engineering designs. This may be incorporated in the Project Documentation Register or maintained separately.

YEI practices a system of Quality Assurance Milestone Checks that are carried out at various points in the project life cycle as shown:



The milestone checks are called:

- PM(S)-series milestone checks – for Project Management(solutions) activities
- PE(S)-series milestone checks – for Project Engineering(solutions) activities
- SN-series milestone checks – for Solutions Engineering activities

The PM(S) milestone check series are structured as indicated here:

Milestone	Document name	Issued by	Endorsed by	Certified by
Project Initiation	PM(S)-1.1 CHECKLIST	Project Manager	N.A.	Review Team
Project Planning	PM(S)-2 CHECKLIST	Project Manager	N.A.	Review Team
Project Execution	PM(S)-3.1 CHECKLIST	Project Manager	N.A.	Review Team
Project Monitor and Control	PM(S)-3.2 CHECKLIST	Project Manager	N.A.	Review Team
Project(FOB) Close out	PM(S)-4.1 CHECKLIST	Project Manager	N.A.	Review Team
Site Initiation	PM(S)-1.2 CHECKLIST	Project Manager	N.A.	Review Team
Site Closeout	PM(S)-4.2 CHECKLIST	Project Manager	N.A.	Review Team

The PE(S) milestone check series are structured as indicated here:

Milestone	Document name	Issued by	Endorsed by	Certified by
Project Initiation	PE(S)-1 CHECKLIST	LPE	Project Manager	Review Team
Basic Design Phase	PE(S)-2 CHECKLIST	LPE	Project Manager	Review Team
Detail Design & Implementation Phase	PE(S)-3 CHECKLIST	LPE	Project Manager	Review Team
Pre-FAT Phase	PE(S)-4 CHECKLIST	LPE	Project Manager	Review Team
Pre-Shipment Phase	PE(S)-5 CHECKLIST	LPE	Project Manager	Review Team

The SN milestone check series are structured as indicated here:

Milestone	Document number	Issued by	Endorsed By	Certified By
SN1 – Functional Spec Planning.	SNW-JC-021	LSE	Project Manager	Review Team
SN2 – Functional Spec Review.	SNW-JC-022	LSE	Project Manager	Review Team
SN4 – Implementation (Generation Planning)	SNW-JC-024	LSE	Project Manager	Review Team
SN5 –Implementation (Generation Review)	SNW-JC-025	LSE	Project Manager	Review Team
SN6 - Internal Test Review.	SNW-JC-026	LSE	Project Manager	Review Team
SN7 - Pre-shipment Review.	SNW-JC-027	LSE	Project Manager	Review Team

Note: SN3 milestone is kept as spare for future usage.

9.3.5 Design and Development Verification

Design verification is the process of confirmation (through the provision of objective evidence) that specified requirements have been fulfilled.

Design verification is carried out by Engineers and Lead Engineers on the project.

Where applicable, a prototype is built and tested to verify the integrity of the design. The Client normally inspects the prototype. The design may be revised based on prototype test results.

System ITPs are developed to systematically test all aspects of the system, to verify the integrity of the system and to provide objective evidence of verification activities.

System ITPs are developed by the respective work groups or specialist sub-vendors for this project and it is reviewed for completeness and effectiveness by the PM and the Client.

System ITPs are controlled documents and may be modified in accordance with the standard document change control procedure applicable for this project. These changes are implemented as directed by the PM.

System ITPs consist of (as applicable):

- Title, or description
- Document number
- Revision number
- Date of issue
- Page number
- Documentation reference
- Work area/ location
- Item/activity number
- Activity
- Acceptance criteria
- Inspection columns for ITP

The PM ensures that skilled resources are available for all specialist inspection and testing requirements. [See section 8.2.2.](#)

9.3.6 Design and Development Validation

Design validation is the process of confirmation (through the provision of objective evidence) that the requirements for a specific intended use or application have been fulfilled.

Design validation is carried out by the client at the FAT/IFAT.

YEI maintains a punch list (log) of all validation non-conformities. The corrected non-conformities are re-validated by the client and signed off for closure.

9.3.7 Control of Design and Development Changes

The PM or LPE shall review the scope and impact and document all changes in accordance to YEI change control requirements. [See section 9.2.2.](#)

9.4 Purchasing

9.4.1 Purchasing Process

Purchasing of sub-systems and components is carried out in accordance to YEI purchasing procedures.

YEI has a list of approved suppliers and a system for qualifying new suppliers as well as evaluation of existing suppliers.

Supplier audits may be scheduled based on YEI's level of confidence on its suppliers.

9.4.2 Purchasing Information

Purchasing information is gathered and formulated from the Client's specification and from YEI specifications. The purchasing information is submitted to YEI/YEA procurement department for consolidation of all purchasing requirements. Hence all purchasing information is duly documented in the purchasing system for traceability and verification.

9.4.3 Verification of Purchased Product

Purchased products are inspected upon receipt by the Engineer or LPE.

Inspections of incoming goods consist of:

- Verification against PO to confirm correctness
- Visual inspection for possible damage

- Functional check of operation based on specification

9.5 Production and Service Provision

9.5.1 Control of Production and Service Provision

Work instructions and work standards for YEI engineering and production processes are documented to facilitate standardization and for achieving quality.

9.5.2 Validation of Processes for Production and Service Provision

YEI engineering processes are reviewed periodically at internal audits. [See section 10.2.2.](#)

9.5.3 Identification and Traceability

During production, all panels are identified by a “component tag” label. This label identifies the component number and its current state of completion for identification and traceability.

9.5.4 Customer Property

YEI occasionally receives customer supplied equipment or instruments for installation within YEI supplied panels or consoles.

Customer supplied equipment or instruments are received and stored at YEI/YEA premises in the same manner and with the same care as for YEI purchased items.

If any customer property is lost, damaged or found unsuitable for use, it is reported to the Client and records are maintained. [See section 6.2.4.](#)

Customer property may include intellectual property such as software **and personal data.**

9.5.5 Preservation of Product

YEI takes care to preserve the conformity of all products during internal processing and delivery to destination. This preservation includes proper identification, handling, packaging, storage and protection.

A significant scope of many YEI projects is software related. YEI has a server disaster recovery system in place to safeguard software engineering work stored in the server. This server disaster recovery system also encompasses an off-site data storage scheme that is provided by a commercial data warehouse vendor.

9.6 Control of Monitoring and Measuring Devices

YEI uses a variety of common test and measuring devices such as multimeter. All test and measuring devices are calibrated by an external calibration laboratory. Calibration is valid for one year, unless recommended by the external calibration laboratory.

Engineers use only calibrated instruments when performing verification of systems at the staging area. [See section 9.3.5.](#)

The tag numbers and serial numbers of test and measuring devices are listed in the System ITP. These are traceable to calibration records and calibration certificates maintained by YEI.

Confirmation of the ability of computer software to satisfy the intended application shall be confirmed prior to initial use and reconfirmed as necessary. Confirmation includes verification and configuration management to maintain its suitability for use.

10 Measurement, Analysis and Improvement

10.1 General

YEI has a comprehensive system of monitoring, measurement, analysis of data leading to internal improvement of processes.

The project team shall maintain a comprehensive dossier of test records to ensure and to demonstrate the conformity of the product.

The QM periodically inspects test records and punch lists to understand nature of non-conformities and to formulate continual improvement programs.

10.2 Monitoring and Measurements

10.2.1 Customer Satisfaction

YEI has a system of customer interview which are conducted at the end of FAT/IFAT. This is the means of obtaining information on customer satisfaction. Data are charted for analysis. This is reviewed by PSC Management at management review meetings.

10.2.2 Internal Audit

YEI has an internal audit program that meets the ISO9001:2008 QMS requirements.

YEI internal audits are intended to confirm conformance to engineering practices and processes.

The Operations Head selects the projects to be audited. The areas audited are based on the internal audit plan and these are listed in the audit schedule.

The Internal audit scheme is one of the drivers of the YEI continual improvement program.

YEI also has a system of supplier audits. [See section 9.4.1.](#)

10.2.3 Monitoring and Measurement of Processes

YEI employs a system of milestone checks to ensure that engineering processes achieve planned results. [See sections 9.3.4.](#)

10.2.4 Monitoring and Measurement of Product

YEI tests all aspects of the system before delivery to site. [See sections 9.3.5.](#)

10.3 Control of Nonconforming Product

All non-conforming products that arise from testing activities are registered with QM in the CAR.

CAR is issued to the vendor to record the non-conformity and to monitor recurrence of such non-conformity if any.

YEI maintains a database of CAR. [See section 10.5.2.](#)

Non-conforming products shall be segregated from the system to prevent un-intended use or application of the product in the final system.

10.4 Analysis of Data

YEI collects QC data relating to:

- Customer Satisfaction Survey reports
- IQA reports
- Conformity to product requirements
- Characteristics and trends of processes and products
- Suppliers

QC data is compiled in the company intranet for general information and forms the basis for deciding continual improvement efforts.

10.5 Improvement

10.5.1 Continual Improvement

YEI has an established system of Continual Improvement driven by Top Management via quality policy, quality objectives, management review meeting, results of audit findings, and corrective and preventive action.

10.5.2 Corrective Action

YEI has an established system of Corrective Action to eliminate the cause of non-conformities in order to prevent recurrence. All corrective actions are reported and logged in the database for review and analysis.

10.5.3 Preventive Action

Preventive action is intended to eliminate potential nonconformities. YEI combines preventive action with the system of corrective action.

11 End of document