METTERS INDUSTRIES INC.

Quality Management Process

1 Introduction

1.1 Purpose

The Metters Quality Assurance Team approach towards "Total Quality Management" will involve processes required to ensure that projects will meet or exceed customer requirements and expectations. It will include the process activities that determine the quality policy, objectives and responsibilities as recommended by the Quality Program and Project Management Plan.

The major processes as described further in the following subsections and included in the approach to Total Quality Management are:

- Quality Planning
- Quality Assurance
- Quality Control
- Quality Improvement

1.2 Scope

To identify all standards (mandatory requirements) to be applied, how the compliance is to be monitored and assured, and identifies the standards, practices, and conventions to be used in definition, collection, and utilization of software measurement data, Develop schedules, checklist, Perform verification & validation.

1.3 Roles

Project Manager (PM) – Will assign a qualified Quality Assurance Manager (QAM). The PM will work with the QAM to identify and verify the implementation of corrective actions. Develop a Quality Assurance Plan (QAP) and help assign roles and manage the execution of the plan including all related audits and management reports.

Quality Assurance Manager (QAM) - Develops a Quality Plan and establishes Quality Improvement requirements. Assign Roles and Responsibilities to make up the QA Team. Monitor's Compliance and submits progress/status Reports.

Quality Assurance Team (QAT) -Identifies all standards (mandatory requirements) to be applied, how the compliance is to be monitored and assured, and identifies the standards, practices, and conventions to be used in definition, collection, and utilization of software measurement data.

1.3.1 Traceability

- QA Audit Log

1.3.2 Processes

- Project Management
- Requirements Management
- Configuration Management

1.3.3 Templates

- Quality Assurance Plan Template
- Audit Report Template

1.3.4 Checklists

- Quality Management Audit Checklist

1.3.5 Tools

- Metters PAL

2 Quality Management Processes

2.1 Quality Planning

The Quality Planning process ensures that the project teams identify the Quality Assurance activities that will be performed throughout the lifecycle of the project and develop a Quality Assurance Plan (QAP) using the Quality Assurance Plan template in the Metters PAL. In this process, the QA team identifies the standards (mandatory requirements) to be applied, how the compliance is to be monitored and assured, and identifies the standards, practices, and conventions to be used in definition, collection, and utilization of software measurement data.

2.1.1 Inputs

Input	Details of Input and Remarks	Ref.
Statement of Work (SOW) or Contract	Document that captures and defines the work activities, deliverables and timeline a vendor will execute against in performance of specified work for a customer. Detailed requirements and pricing are usually included in the Statement Of Work, along with standard regulatory and governance terms and conditions maintained throughout the project life cycle. Deliverables and other reports.	Contract
Historical Information	Forms, photo's, briefings, ID numbers,	Clients/Users
Quality Assurance Plan	Standards (mandatory requirements) to be applied, how the compliance is to be monitored and assured, and identifies the standards, practices, and conventions to be used in definition, collection, and utilization of software measurement data.	QAP template in Metters PAL

2.1.2 Activities

1. *Assignment of a qualified Quality Assurance Manager (QAM)*

A qualified QAM meeting all the requirements set forth in the SOW or Contract must be designated for each project. The roles and responsibilities of the QAM are:

- Prepare the QAP using the QAP template in the Metters PAL. The plan needs to be approved and maintained throughout the project life cycle
- Manage the execution of the plan including all related audits and management reports
- Objectively evaluate processes and work products against the Metters Process Model in order to identify non compliances
- Work with the PM on scheduling the various audits and reviews during the project life cycle
- Provide feedback to the PM and the Project Staff on the results of the quality assurance activities
- Work with the PM to identify and verify the implementation of corrective actions
- Prepare reports, metrics and submit it to PM and high level management
- Maintain all audit documents and artifacts under Configuration Management

2. *Recruiting Quality Assurance Personnel, depending on the project size and complexity*

The PM along with the QAM must be responsible for putting together a team to support the quality assurance activities and procedures outlined in the QAP. The recruited staff will be responsible for:

a. Supporting the QAM in performing the audits and reviews during the project life cycle
b. Supporting the QAM in preparing reports and metrics
c. Supporting the QAM in maintaining all audit documents and artifacts under Configuration Management
d. Performing the Software Verification and Validation activities as outlined in the QAP

3. *Development of QAP*

a. The QAM will be responsible for the development and maintenance of the QAP. The QAP will be developed using the QAP template in the Metters PAL and will take into consideration the standards and regulations, deliverables etc identified in the SOW or Contract. The QAP will also take into account historical data and estimation techniques mentioned in the Schedule Management section to estimate efforts for QA activities. The QAP will be kept under configuration control and will need to be formally approved by Metters Senior Management and also by the Project Sponsor, if specified in the contract or the SOW.

1.1.1 Outputs

Output	Details of Output and Remarks	Ref.
Quality Assurance Plan (QAP)	Mandatory requirements have been applied; compliance is being monitored and assured. Still in the Collection process of software measurement data.	QAP template in Metters PAL

2.2 Quality Assurance

2.2.1 Inputs

Input	Details of Input and Remarks	Ref.
Quality Assurance Plan (QAP)	Standards (mandatory requirements) to be applied, how the compliance is to be monitored and assured, and identifies the standards, practices, and conventions to be used in definition, collection, and utilization of software measurement data. Data still being collected.	QAP template in Metters PAL
Operational definitions (from SOW or Contract)	**Completeness** (for Process) – Process tasks are completed as defined in the Metters Process Model **Expectedness** (for Process) – Process outputs and results are as expected **Integrity** (for Process) – Process inputs are defined and are correct revisions/versions	Statement Of Work or Contract Metters Process Model
QA Audit Checklist	Define the audit criteria for the product or process being audited to include checks for completeness, compliance, consistency, and traceability.	QA Audit Checklist templates
QA Audit Report	Record and report the audit findings on the audit checklist and include comments or notes, as applicable.	QA Audit Report templates
Project Schedule	The project schedule is a useful planning and communication tool for monitoring and reporting the progress of a project.	Project Management Plan

2.2.2 Activities

1. *Prepare for the Audit*
    a. The QAM should coordinate with the PM and request and gather all necessary documents and artifacts to successfully complete the audit
    b. The PM is responsible for providing the QAM with all necessary documents, work products, and artifacts necessary to complete the audit
    c. QA should define the audit criteria for the product or process being audited to include checks for completeness, compliance, consistency, and traceability.
        I. **Completeness** (for Product) – Product is complete and includes the appropriate level of detail
        II. **Completeness** (for Process) – Process tasks are completed as defined in the Metters Process Model
        III. **Timeliness** (for Process) – Process is performed when scheduled and when ready
        IV. **Compliance** (for Product) – Product meets applicable standards and requirements
        V. **Compliance** (for Process) – Process is performed in accordance with documentation
        VI. **Consistency** (for Product) – Product is internally and externally consistent
        VII. **Traceability** (for Product) – Product fulfills its allocated requirements.
        VIII. **Expectedness** (for Process) – Process outputs and results are as expected
        IX. **Integrity** (for Process) – Process inputs are defined and are correct revisions/versions

    QA should develop the product/process audit checklist using the **Audit Checklist Form** (Appendix B of the QAP) or utilize the already the existing Audit Checklist Form templates for that process or product.

2. *Perform the Audit*
    a. The QA team should evaluate the product/process against the criteria defined in the Audit Checklist Form to determine compliances: **Yes** (Product/Process meets the defined criteria), **No** (Product/Process does not meet the defined criteria), **N/A** (The specific audit criteria does not apply to the product/process). For the "non compliant" audit criteria, the QA team should record the non compliances in the "Non Conformances" section of the checklist
    b. The QA team should record the audit findings on the audit checklist and includes comments or notes, as applicable. The QA team should document the product/product non conformances in the "Non Conformances" section of the Audit Checklist

3. *Report Audit Results*
    a. The QAM should prepare an audit report using the Quality Assurance Audit Report template in the Appendix C of the Metters QAP
    b. The Audit Report should then be submitted to the PM

c. The QAM should place the Audit Checklist Form and Audit Report under Configuration Management control

4. *Define Action Items and Corrective Actions*
    a. The QAM should analyze the non compliance issues with the PM and staff
    b. The PM and designated project staff should determine action items and corrective actions needed to resolve all non compliance issues and determine expected date of resolution
    c. The PM should submit the completed Audit Report for the product/process to the QAM and place it under Configuration Management control
    d. The QAM should schedule the next audit for the product/process with the PM after the expected date of resolution of the action items and corrective actions
    e. The PM should update the Project Schedule accordingly
    f. The QA team should verify the corrective actions at the next audit after the expected date of resolution

5. *Update QA Status Log*
    a. The QA team should record the audit results in the QA audit log. Data recorded include item audited, audit date, audit type (product, process), audit status (accepted/unaccepted), Number of non conformances opened, number of non conformances closed

2.2.3 Outputs

Output	Details of Output and Remarks	Ref.
Completed Audit Checklist	Checklist has been completed	QA Audit Checklist templates
Completed Audit Reports	Audit Report has been completed	QA Audit Report templates
Updated Project Schedule	Management Plan has been updated	Project Management Plan
Updated QA Status Log	QA log has been updated and report sent to PM	QA Status Log

2.3 Quality Control

Quality Control process involves measuring and monitoring specific project results to determine if they comply with project specifications and quality standards, and identify ways to eliminate causes of defects. Quality Control practices should occur during product development, product acquisition, product construction at the end of development and throughout product change and operation.

The main activities included in Quality Control process are:

- Verification & Validation
- Software Change Control
- Configuration Management

2.3.1 Inputs

Input	Details of Input and Remarks	Ref.
Work results (Functional Product/Software)	Formal Qualification Review	Project Management Plan QA Audit Report templates QA Status Log
Quality Assurance Plan (QAP)	Standards (mandatory requirements) to be applied, how the compliance is to be monitored and assured, and identifies the standards, practices, and conventions to be used in definition, collection, and utilization of software measurement data. Data still being collected.	QAP template in Metters PAL
Operational Definitions (from SOW or Contract)	**Unit Testing**: This testing is to be performed by the developer from the Project development team responsible for working on the specific unit (requirement). The test is to be performed to ensure that the specific functional characteristics have been achieved as specified in the corresponding RDD. **System Testing**: This testing is to be performed by the Project development and testing team after integrating the individual units developed based on the individual requirements defined in the RDD.	Contract RDD
CCB Approval minutes	Change Request Document	CRD
Audit Checklists	Define the audit criteria for the product or process being audited to include checks for completeness, compliance, consistency, and traceability	QA Audit Checklist templates
Requirement Definition Document (RDD)	A statement of **general requirements**. This is an executive summary of the identified requirements	Contract RDD

2.3.2 Activities

1. *Software Verification and Validation*
    a. The QA team should prepare a software Verification and Validation Testing (VV&T) Plan to include the following verifications throughout the project life cycle:

i. Requirements and Design Review: This review is performed during the Requirements Verification phase (Please refer to the *Requirements Verification Process* in the Requirements Management Section). At the completion of the review, "Requirements and Design Phase Baseline" is established. (Please refer to the *Configuration Identification and Control Process* in the Configuration Management Section). Assignment of a unique identifier and label to the Change Request Document by the CMG signals the completion of the Requirements and Design Review

ii. Code Inspections (Formal Qualification Review): This review is performed by the Project Staff (Development team and Team Leads) to ensure that the software is ready for testing phases (system/integration/user acceptance). The Formal Qualification Review involves the following:
    1. Code Inspections to ensure that the modified configuration items meet the coding standards and performance requirements for the organization as specified in the SOW or Contract
    2. Reviews of the Requirement Definition Document (RDD) to ensure that Section 2.11 "Files Modified" has been updated with the list and path of the modified configuration items for the respective requirement
    3. Verification that the items and their respective versions listed under Section 2.11 "Files Modified" of the RDD are placed under the configuration management and promoted to the appropriate promotion level.

    At the completion of the Formal Qualification Review, the "Build/Test Phase Baseline" is established. (Please refer to the *Configuration Identification and Control Process* in the Configuration Management Section). Establishing the "Release Notes" and placing it under configuration control signals the completion of the Formal Qualification Review

iii. Production Readiness Review: This review is performed to ensure that the modified or new version of the Product is ready for deployment to Production. This is the first step towards establishing a "Release Baseline". (Please refer to the *Configuration Identification and Control Process* in the Configuration Management Section). The detailed description of this review process is provided under *Configuration Audits and Reviews* process in the Configuration Management Section. Upon completion of the review, the Change Request Document should be presented to the CCB requesting approval for deployment of the Product Release. Approval of the Change Request Document for Production deployment signals the completion of the Production Readiness Review

b. The following validation activities need to be performed during the testing phase of the project life cycle. The project development team is responsible for assigning the

appropriate promotion level and identifying the configuration items for each of the testing phases mentioned below. The CMG

i. Unit Testing: This testing is to be performed by the developer from the Project development team responsible for working on the specific unit (requirement). The test is to be performed to ensure that the specific functional characteristics have been achieved as specified in the corresponding RDD
ii. System Testing: This testing is to be performed by the Project development and testing team after integrating the individual units developed based on the individual requirements defined in the RDD
iii. Integration Testing: This testing is to be performed by the Project development, testing, and any other interfacing project teams.
iv. User Acceptance Testing: This testing is to be performed by the product or software test user group to validate that the modified product against the requirements specified in the Change Request Document

2. *Software Change Control*
    a. Please refer to the *Requirements Change Control Process* under the Requirements Management Section for details on this process. The QA team would ensure that the appropriate verifications and validations (detailed in this Management Section) have been performed as part of this process.

3. *Configuration Management*
    a. Please refer to the Configuration Management Section for details on this. The QA team would ensure that the appropriate verifications and validations (detailed in this Management Section) have been performed as part of this process.

4. *Update QA Status Log*
    a. The QA team should record the audit results in the QA audit log. Data recorded include item audited, audit date, audit type (product, process), audit status (accepted/unaccepted), Number of non conformances opened, number of non conformances closed

2.3.3 Outputs

Output	Details of Output and Remarks	Ref.
Verification, Validation &Test Plan (VV&T)	Formal Qualification Review	QA Audit Report templates
Completed CM Process Audit Report	Completed Report	CM Process Audit
Completed CM Process Checklist	Completed checklist	CM Process Checklist
Updated Project Schedule	Updated	Project Management Plan
QA Status Log	Updated	QA Status Log Template

2.4 Quality Measurements

The quality measurements procedure defines how the QA team analyzes and reviews its effectiveness.

2.4.1 Inputs

Input	Details of Input and Remarks	Ref.
Quality Assurance Plan (QAP)	Standards (mandatory requirements) to be applied, how the compliance is to be monitored and assured, and identifies the standards, practices, and conventions to be used in definition, collection, and utilization of software measurement data. Data still being collected.	QAP template in Metters PAL
QA Status Log	Quality Assurance Status of project and different tasks.	QA Status Log Template
Project Schedule	The project schedule is a useful planning and communication tool for monitoring and reporting the progress of a project.	Project Management Plan

2.4.2 Activities

1. *Analyze audit nonconformance status*
   a. The QAM should review the QA Status Log monthly to determine the audit nonconformance closure status
   b. The QA team should assess current "total opened" to "total closed" nonconformance status, compare current closure status to previous months, and determine nonconformance trend (negative or positive)
   c. The QA team should identify reasons for the audit nonconformance trend
   d. The QA team should identify the audit non conformance distributions for functional areas by rank ordering non conformances by functional areas (e.g., Project Management, CM, Configuration Management, Requirements Management) and process audit criteria to identify the functional areas and process audit criteria that have the most audit non-conformances.
   e. The QA team should identify the audit non conformance distributions for Products by rank ordering non-conformances by product types (e.g. Code) and product audit criteria to identify the product types and audit criteria that have the most product audit non-conformances.

2. *Analyze QA progress (schedule) status*
   a. The QAM should review the Project Schedule to determine the QA progress (schedule) status.

b. The QAM should assess the current status (total QA activities planned to total actual QA activities performed), compare current variance to previous months variance, and determine QA progress trend (negative or positive).
c. The QA team should identify reasons for QA progress variance and trend.

3. *Record QA measurement results*
   d. The QAM should document the following measurements in the Progress Reports (Monthly/Weekly) and submitted to the PM
      i. Number of QA Activities planned, Number of QA Activities performed
      ii. Number of Non conformances reported, Number of non conformances closed
      iii. QA Progress and Non conformances trends

2.3.4 Outputs

Output	Details of Output and Remarks	Ref.
Updated Performance and Progress Reports (Monthly and Weekly Status Reports)	Weekly/Monthly Status Reports	Status Report Template