



# **SOFTWARE DEVELOPMENT METHODOLOGY**

## **STEP**

**Structured Technical Engineer Production Methodology**

**March 10, 2003**

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## **1. INTRODUCTION**

This document describes the normal practices used by Tango Enterprises Inc. (“Tango”) in its software development projects, in the absence of any customer imposed requirements. If the customer wishes to impose additional requirements, the requirements are to be identified in the negotiated contract.

Although Tango is not ISO 9000 certified, it is Tango’s intention to use the principles within ISO-9000 as a guideline for its software development methodology, **Structured Technical Engineer Production Methodology (STEP)**.

This document is updated as project experiences or new standards dictate. Suggestions for improvement are solicited.

This document presents the following topics:

- Section 2 - Project Responsibilities
- Section 3 - Software Development Project Methodology
- Section 4 - Configuration Management Practices
- Section 5 - Quantity Assurance System

## **2. PROJECT RESPONSIBILITIES**

Tango assigns a Project Manager and Lead Developer to each project.

### **2.1 PROJECT MANAGER**

The Project Manager is given project responsibility and authority and manages a team of personnel by the President. The responsibilities of the Project Manager are described below:

- **Customer Interaction.** The Project Manager is the primary interface to the customer's Project Manager. This responsibility involves participation in meetings, both face-to-face and via telephone, to discuss project progress. The Project Manager is responsible for facilitating the exchange of information, technical and administrative, between Tango and the customer to ensure a smooth progression toward project completion. The Project Manager conducts a Project Kickoff Meeting at the customer's site. Project status reviews detailing progress, issues, etc., are conducted with the customer's Project Manager every month, supplemented by weekly conference calls. The status report includes the following:
  - Updated project schedule
  - Summary of pending and upcoming activities
  - Description of current problem areas and resolutions
  - Updated list of action items with status and required resolution dates
  - Status of unresolved issues
  - Any other pertinent information that may affect the project
- **Project Planning.** The Project Manager prepares a Project Plan to establish the baseline against which the project is executed. Task planning is directed by the Project Manager to employees and subcontractors.
- **Project Monitoring and Control.** The Project Manager maintains effective control of the project. The Project Manager closely monitors all aspects of the project to ensure that the technical, cost, schedule, and customer satisfaction objectives are met.
- **Risk Management and Mitigation.** The Project Manager is responsible for identifying and mitigating project risks and, pursuing opportunities that enhance project results.
- **Internal Management Reviews.** Tango's internal review process assures continuous visibility by senior management into the project. The Project Manager reviews the project's progress with the President on at least a weekly basis.
- **Delivery.** The Project Manager ensures that all contract deliverables are reviewed, tested, approved, and delivered to the satisfaction of the contract requirements and the customer.

### **2.2 LEAD DEVELOPER**

The Lead Developer is a highly skilled software architect and programmer who follows an established, proven approach to development that includes requirements analysis, design, development (programming), unit/subsystem/system testing, on-site installation and cutover to operations. These tasks include technical documentation, quality control, and configuration management, as described in subsequent sections of this document.

### **3. SOFTWARE DEVELOPMENT PROJECT METHODOLOGY (STEP)**

This section is organized into the following subsections:

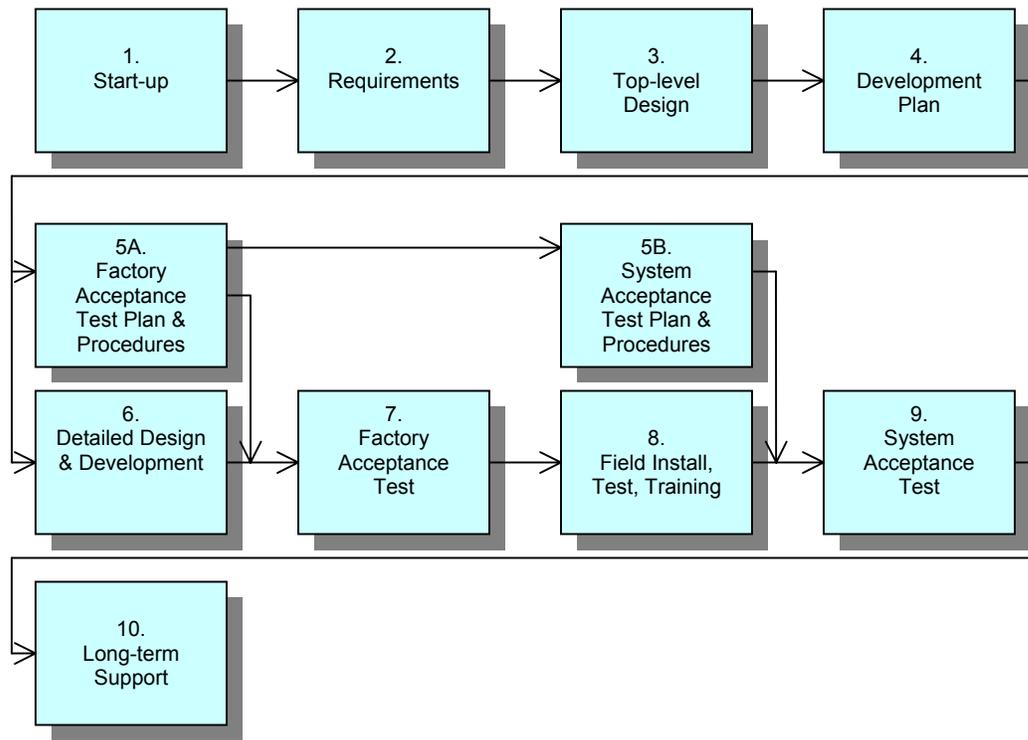
- 3.1, Overview – presents a high-level view of Tango’s methodology
- 3.2, Firm-fixed Price Contracts – shows how the project methodology applies to FFP contracts
- 3.3, Other Types of Contracts – discusses variations (to the methodology for FFP contracts) for other possible types of contracts

#### **3.1 OVERVIEW**

Tango has a systematic, common-sense approach to performing software development projects that keeps them on track and provides check points for both Tango and the customer.

- Projects are broken down into ten standard software development phases that are characterized by tasks and deliverables.
- This project breakdown can be extended if necessary for a specific project to include tasks and/or phases that are not software development. For example, a project might include the acquisition and installation of computer system hardware, which is not within the standard software development phases.
- A schedule is developed for each phase and, where further detail is appropriate, for tasks within each phase.
- A budget is developed for each phase and, where further detail is appropriate, for tasks within each phase. In addition, there is another line item in the budget called “0. Project Management” that extends the entire duration of the project and includes the Project Manager’s tasks.
- Selected tasks and/or deliverables may be waived if not applicable for the specific project. Waivers must be approved by Tango’s President or his designee.
- All internal and external deliverables (documentation and software) are maintained under Configuration Control on Tango’s servers to ensure that all parties have the latest items and that only authorized persons can make changes.

Figure 3.1-1 depicts the 10 standard phases, their sequencing, and their dependencies.



**Figure 3.1-1 Ten Standard Phases**

### 3.2 FIRM FIXED-PRICE CONTRACTS

The most notable characteristic of Firm Fixed-Price (FFP) contracts is that the requirements are well understood prior to contract start.

During the proposal effort for a FFP contract, Tango:

- Analyzes all provided requirements (from the RFP, amendments, directives, negotiations).
- Develops a preliminary Top-level Design and includes it in the proposal.
- Presents any assumptions in its proposal to clearly establish the basis for its pricing.
- Develops a preliminary Project Plan showing project organization, high-level schedule, phases, tasks, and deliverables, and includes it in the proposal.
- Develops estimates of the labor, material, and related costs, and formulates the proposed price.

Note that Tango typically offers a Warranty for the software for FFP contracts.

Table 3.2-1 depicts a representative FFP project's phases, tasks, and deliverables.

**Table 3.2-1 Project Phases, Tasks, and Deliverables**

<b>PROJECT PHASES</b>	<b>DELIVERABLES (C = for customer)</b>
<b>PHASE 1. START-UP</b>	
Adjust the preliminary Project Plan to reflect actual start date	Project Plan [C]
Initiate the project internally	
Prepare for & conduct Project Kickoff Meeting as required with the customer	
<b>PHASE 2. REQUIREMENTS</b>	
Consolidate all requirements (from the RFP, amendments, directives, negotiations) into a single document.	Requirements Specification [C]
Obtain customer approval and signoff	
<b>PHASE 3. TOP-LEVEL DESIGN</b>	
Complete the top-level design that had been started during the proposal	Top-level Design Specification [C]
Develop prototype of User Interface, review with customer (optional)	Prototype
Conduct internal Top-level Design Review	
Prepare for & conduct Top-level Design Review for customer (optional)	
Obtain customer approval and signoff	
<b>PHASE 4. DEVELOPMENT PLAN</b>	
Prepare and review detailed internal plans for Phases 5 through 9 (tasks, budgets, schedules, staffing)	Development Plan
<b>PHASE 5. TEST PLANS &amp; PROCEDURES</b>	
5A. Factory Acceptance Test (FAT)	
Develop FAT Plan & Procedures	FAT Plan & Procedures
Obtain customer critique of FAT Plan & Procedures	
Setup FAT environment	
Develop testing tools (e.g., simulator for stress testing)	
Obtain customer approval and signoff (optional)	
5B. System Acceptance Test (SAT)	
Prepare SAT Plan & Procedures	SAT Plan & Procedures [C]
Obtain customer approval and signoff	
<b>PHASE 6. DETAILED DESIGN &amp; DEVELOPMENT</b>	
Develop detailed design	Detailed Design Document
Conduct internal Detailed Design Reviews	
Establish development environment	
Develop software	
Conduct code walk-throughs	
Conduct development tests (unit, subsystem, system)	
Conduct stress tests	
Prepare software for Factory Acceptance Test	Software ready for FAT
<b>PHASE 7. FACTORY ACCEPTANCE TEST</b>	
Conduct FAT	Test results
Resolve open issues, retest	FAT-tested Software
Obtain customer approval and signoff (optional)	
<b>PHASE 8. FIELD INSTALLATION, TEST, &amp; TRAINING</b>	

<b>PROJECT PHASES</b>	<b>DELIVERABLES (C = for customer)</b>
Install & test software at customer's site	Installed Software [C]
Prepare user documentation (if required)	User Manual [C]
Prepare training materials	Training Materials [C]
Conduct training	
<b>PHASE 9. SYSTEM ACCEPTANCE TEST</b>	
Conduct SAT	Test results [C]
Resolve open issues, retest (defer selected items to Warranty w/customer approval)	
Obtain System Acceptance (or Conditional System Acceptance) and signoff	Final Software [C]
Prepare and deliver Source Code, Software Media Description, and Install Program (as required)	Source Code, Software Media Description, Install Program [C]
<b>PHASE 10. LONG-TERM SUPPORT</b>	
Perform Warranty repairs	
Maintenance	
Enhancements	

Each project phase for such an FFP project is described below.

### **3.2.1 Phase 1 – Start-up**

The preliminary Project Plan developed during the proposal is now adjusted since the actual contract start and finish dates are known and contractual matters have been settled. The resulting Project Plan is a key tool for the Project Manager to communicate with his team and the customer. It is reviewed internally on a weekly basis for compliance and possible corrective action as part of the ongoing responsibility of the Project Manager.

It is recognized that many planning details cannot be thoroughly addressed at the beginning of a FFP project, since the top-level design is not complete. Therefore there is a second round of detailed planning in Phase 4, Development Plan.

The ten phases, their subordinate tasks, plus any additional tasks form the structure for the Project Plan. Dependencies are indicated, and each line item is scheduled and budgeted. Key milestones are included in the schedule, and there is at least one milestone every month. Milestones that require involvement by the customer (such as the provision of customer-furnished equipment) or a third party under the direction of the customer (such as the documentation of an external system interface) are clearly indicated.

The Project Plan also includes staffing, special needs of the project (such as new development tools, space at the customer's facility, etc.). The President critically reviews the Project Plan. The Project Plan is then presented to the customer at the Project Kickoff Meeting, if required by the customer, at a level of detail consistent with the requirements of the contract.

### **3.2.2 Phase 2 – Requirements**

For FFP projects, requirements have been clearly defined by the customer (and referenced by Tango in its proposal) prior to contract start. Often these requirements have been conveyed in a variety of ways and formats, such as via the RFP, amendments, clarifications, directives, and negotiations. In Phase 2 Tango

consolidates these requirements from the variety of sources into a single easy-to-read Requirements Specification. This is intended to

- Simplify requirements analysis by the development team
- Simplify requirements traceability for planning and conducting Factory and System Acceptance Tests
- Simplify communications between Tango and the customer.

Once approved and signed off by the customer, the Requirements Specification becomes the new requirements baseline for the contract, and Phase 3 can begin.

### **3.2.3 Phase 3 - Top-level Design**

Tango develops both a top level and detailed design. This process is intended to create a “best-value” solution that is matched to the customer’s budget, schedule, user sophistication, existing systems, and IT environment. Top-level design addresses system architecture and user interfaces.

During the proposal the top-level design is taken as far as necessary to be able to confidently estimate the effort. During Phase 3 this preliminary top-level design is completed.

Tango believes that a solid architecture is the critical foundation for ultimate system success. Therefore the architecture is carefully crafted taking all the following issues into account:

- Information sharing with other systems and users
- Breakdown of stovepipes
- Functionality and functional growth
- Performance enhancement and responsiveness
- Ease of use
- Security, survivability, and redundancy
- Reliability, maintainability, and supportability
- Infusion of new technology
- Scalability
- Internet vs. client/server, layered vs. monolithic functionality

Also during this phase, and if agreed to in advance with the customer, Tango develops a prototype of user interfaces to ensure that all parties share a common understanding of how the system will interact with the end users. Tango concentrates on ease of use by developing intuitive user interfaces, functional accessibility through simple navigation, on-line help, and (if applicable) novice plus expert modes.

Top-level design culminates in the Top-level Design Specification; this is critically reviewed by the President and senior technical staff. Some customers require a Top-level Design Review. Once the customer approval and signoff of the Top-level Design Specification has been obtained Phase 4 can begin.

### **3.2.4 Phase 4 – Development Plan**

At this point Tango has substantially more technical information than at the project’s start, and is well-positioned to refine the planning for Phases 5 through 9 to the next level of detail. This next level of planning, called the Development Plan, is for internal purposes only. The Development Plan is disseminated to the entire project team to ensure that technical, cost, and schedule objectives are clear.

Phase 6, Detailed Design and Development, is the longest phase and often extends well beyond one month. The software is generally broken into several major components that can be developed in parallel or in a staggered pattern. The Development Plan includes milestones for development and test of each component, and then integration with other components, thereby providing greater visibility into this long phase.

Completion of this phase initiates two parallel phases: Phase 5, Test Plans and Procedures, and Phase 6, Detailed Design and Development.

### **3.2.5 Phase 5 – Test Plans and Procedures**

There are two major tests that are conducted during the project:

- The Factory Acceptance Test (FAT) is the last test conducted at Tango's laboratory before the software is installed at the customer's site.
- The System Acceptance Test (SAT) is the last test conducted at the customer's site; successful completion results in system acceptance.

Both of these tests are formal. This means that:

- Test plans and procedures are developed and documented.
- Tests are witnessed by a party that did not perform the development.
- Test results are documented.
- Open issues are documented, tracked, and resolved.

These steps assure that the testing is thorough and that tests are repeatable for regression testing of future modifications to the system.

This Phase is divided into 5A, FAT Test Plan and Procedures, and 5B, SAT Test Plan and Procedures. Phase 5A must be completed in time to start Phase 7, FAT; Phase 5B must be completed in time to start Phase 9, SAT.

It is possible that the FAT cannot test all functional and performance aspects of the software, as Tango's laboratory might not be able to fully replicate the customer's environment. For example, the customer's environment might include interfaces to external systems that can at best be simulated (not replicated) at Tango, or the customer's environment might include a more extensive suite of equipment. Any simulators (hardware and/or software) used for testing are developed under this Phase.

The SAT is an expansion of the FAT that includes those tests that can only be performed at the customer site.

Some customers require approval and signoff of FAT Test Plan and Procedures. This is established as part of contract negotiations. Whether or not required, the customer is encouraged to comment on the document since it is a precursor to the SAT Plan and Procedures.

The SAT Plan and Procedures require customer approval and signoff prior to start of Phase 9, SAT.

### **3.2.6 Phase 6 – Detailed Design and Development**

Design and development is conducted at Tango's software laboratory that features an extensive suite of contemporary software development tools and computers. All necessary tools are identified and acquired

if not already available in Tango's laboratory. At least one development computer is set up and dedicated to the given project.

Software detailed design is recorded in a Detailed Design Document that is produced for internal purposes to ensure communication across the development team and to enhance long-term software supportability.

Software development includes code walk-throughs, unit testing, subsystem testing, system testing, stress testing, and internal reviews with senior technical staff.

### **3.2.7 Phase 7 - Factory Acceptance Test**

As described earlier, the Factory Acceptance Test (FAT) is the final test conducted at Tango prior to deploying the software to the customer's facility for field installation. Tango tests all functions and performance to the extent possible given that the software is not actually at the customer's site, and documents test results. Open issues are tracked and resolved.

Some customers require attendance at the FAT. This is established as part of contract negotiations.

Later, once the system is operational, the FAT provides the foundation for regression testing of any repairs or enhancements.

Completion of FAT allows Phase 8, Field Installation, Test, and Training, to begin

### **3.2.8 Phase 8 - Field Installation, Test, and Training**

Installation and test are conducted at the customer's site in the intended operational environment.

Tango provides the User Manual (if required) and training materials, and then conducts training of end users and/or the customer's trainers.

When all field testing is complete and Tango is confident that the software meets all requirements, Phase 9 can begin.

### **3.2.9 Phase 9 - System Acceptance Test**

The System Acceptance Test (SAT) is a formal test that is conducted in accordance with the SAT Test Plan and Procedures at the customer's site. Test results are documented. The SAT is typically witnessed by the customer.

Completion of the SAT initiates the Warranty period. More specifically:

- If no deficiencies are found at the SAT, the system is accepted by virtue of having passed the test, and the Warranty period starts.
- If any deficiencies are identified they are placed on an Open Issues List. Any deficiencies that can be quickly resolved are addressed promptly. The seriousness of any remaining deficiencies is jointly determined by Tango and the customer. If none are of serious consequence Tango requests the customer to grant Conditional System Acceptance. This means the system (less the deficiencies) is accepted, is operational, the Warranty period begins, and the remaining deficiencies are cleared under Warranty. Tango's track record has been to clear the Open Issues List within 1 to 4 weeks of Conditional System Acceptance

Tango provides the source code, software media description, and install program (as required) to the customer after the SAT.

### **3.2.10 Phase 10 – Long-term Support**

Following System Acceptance or Conditional System Acceptance, Tango provides Warranty repairs for deficiencies in the Open Issues List and further identified during the Warranty period.

At the conclusion of the Warranty period the customer is encouraged to enter an Annual Maintenance Program to ensure the long-term health and supportability of the system. In addition Tango can provide long-term support that includes enhancements, follow-on training, and other technical support.

## **3.3 OTHER TYPES OF CONTRACTS**

The most notable characteristic of contracts other than FFP is that the requirements are generally *not* well understood prior to contract start.

Examples of such contracts are:

- A Time-and Materials contract might include the effort for Tango to develop the requirements in cooperation with the customer. Tango recognizes that there could be a wide range of starting documentation from the customer regarding his/her vision and needs, and works closely with the customer while this crystallizes into the Requirements Specification that can successfully drive all subsequent development.
- A Task Order contract might have agreed to rates and broad scope at the time of contract start, but the requirements of any given Task Order are not known until later when the Task Order is provided to Tango. Again, some Task Orders might also include the effort for Tango to develop the requirements in cooperation with the customer.

In general, Tango is willing and able to estimate a project before all requirements are well understood, but is not prepared to make a firm financial commitment until the requirements are fully understood and the top-level design has been started.

The software is not warranted for T&M contracts. Any necessary post-acceptance repairs, enhancements, follow-on training, and other technical support are performed at T&M rates.

## **4. CONFIGURATION MANAGEMENT PRACTICES**

This section establishes and provides the basis for uniform Configuration Management practices for Tango.

### **4.1 REFERENCE DOCUMENTS**

The following documents have helped guide Tango's Configuration Management Practices.

- *ISO 12207 Information Technology - Quality Management System*
- *ISO 10007 Configuration Management*

### **4.2 OBJECTIVES OF CONFIGURATION MANAGEMENT**

Configuration Management covers three basic, essential, and interdependent activities:

- Configuration identification - a discipline for identifying the configuration of an item and documenting its functional and physical characteristics;
- Configuration control - the exercising of established procedures to classify, approve or disapprove, release, implement and confirm changes to agreed specifications and baselines;
- Configuration accounting - the recording and reporting of data concerning configuration identification, approval status of proposed changes and implementation status of approved changes during all phases of the project.

The rest of this section described these three activities.

#### **4.2.1 Configuration Identification**

Configuration Identification consists of decomposing the software architecture into a hierarchical set of software Configuration Items that will each be developed and controlled.

The following baselines are established during development.

- Top-level Design – described in the Top-level Design Specification; equivalent to the government's "functional baseline"
- Detailed Design – described in the Detailed Design Specification; equivalent to the government's "allocated baseline"
- Software – described via in-code documentation; equivalent to the "product baseline"

Each baseline is derived from the previous baseline. The objective of establishing baselines is to define a basis for subsequent software development tasks and to allow reference to, control of, and traceability between Configuration Items.

As the project progresses through the various phases of development, each Configuration Item advances to the next baseline.

#### 4.2.2 Configuration Control

Configuration Control is the responsibility of the Lead Developer, and includes:

- The review and approval/disapproval of Configuration Items that are candidates to advance to the next baseline.
- The systematic receipt, evaluation, and approval/disapproval of Changes. These can include:
  - Changes that are requested by the customer to Tango.
  - Changes suggested by Tango to itself.
  - Changes suggested by Tango to the customer.
- The control of interfaces between software developed by Tango and software developed outside of Tango.
- The systematic receipt, evaluation, and resolution of Software Problem Reports.

##### ***Configuration Items Advancing to the Next Baseline***

Tango's Lead Developer is responsible for evaluating and approving/disapproving the advancement of Configuration Items to the next baseline. The President decides whether to require the Project Manager to conduct an internal Design Review as part of this evaluation process.

##### ***Changes***

Tango's Lead Developer is responsible for maintaining a log of Changes, and for evaluating their technical, cost, and schedule impact.

The Project Manager reviews the log with the Lead Developer on a periodic basis. The frequency of these reviews is established by the Project Manger.

- Changes that do *not* adversely affect the technical, cost, and schedule objectives of the project can be approved/disapproved by the Project Manager.
- Changes that *do* adversely affect the technical, cost, and schedule objectives of the project require the approval of the President.
- Regarding Changes requested by the customer, the Project Manager makes the determination as to whether the change *is* or is *not* within the scope of the contract.
  - If it *is* within scope, the change is handled as above (the first two points).
  - If it is *not* within scope, a proposal is made by the Project Manager to the *customer's* Project Manager that describes the technical, cost, and schedule impact. This proposal requires the approval of both the President and the Chief Financial Officer.

The Lead Developer is responsible for the control of changes, including documentation, development, testing, and release.

##### ***Interface Control***

Interface control consists of establishing and maintaining technical agreements among the different organizations responsible for interfacing systems. Each interface is documented in an Interface Control Document (ICD).

Changes to an ICD require approval of both parties, and otherwise follows the same process as for “Changes” above.

### ***Software Problem Reports***

Tango’s Lead Developer is responsible for: maintaining a log of Software Problem Reports; for determining a solution; and for evaluating their technical, cost, and schedule impact. Controlling Software Problem Reports follows the same process as for “Changes” above.

#### **4.2.3 Configuration Management Status Accounting**

The baselines and the Configuration Items provide the structure for Configuration Management Status Accounting, which is the recording of:

- Advancements of Configuration Items to the next baseline
- Changes
- Interface Control
- Software Problem Reports

The Lead Developer is responsible for Configuration Management Status Accounting in parallel with Configuration Control.

## **5. QUALITY CONTROL PRACTICES**

This section establishes and provides the basis for a uniform Quality Assurance System for Tango.

### **5.1 PRESIDENT’S QUALITY STATEMENT**

“Tango’s objective is to achieve sustained, profitable growth by providing products and services, which consistently satisfy the needs and expectations of its customers. This requires a consistently high level of quality in all activities of the company.

“Achievement of this policy involves all staff. Each person is individually responsible for meeting the technical quality, cost, schedule, and customer satisfaction objectives of their work. This expectation is explained to each employee by the President or a senior manager.

“To achieve and maintain the required level of quality the President retains overall responsibility for the Quality Assurance System, with routine operation controlled by the senior managers.

“The objectives of the Quality Assurance System are:

- To be compatible with International Standard ISO 9001 (Quality Systems).
- To achieve and maintain a level of quality that maximizes customer satisfaction and company stability. “

*Scott. Butler – President and CEO  
July 2002*

### **5.2 DEFINITIONS**

The terms and descriptions used in this Manual are generally defined within ISO 9001 - Quality Systems.

The following additional definitions apply for items not covered by ISO 9001 documents:

- Site - any location, other than Tango’s established premises, where work is undertaken as part of a formal contract

### **5.3 OVERVIEW**

Tango is not ISO 9001-certified, but has developed this Quality Assurance System to be compatible with the requirements of ISO 9001. The Quality Assurance System applies to all activities of the Company.

The Quality Assurance System is documented and structured in 2 levels:

- Level 1: Quality Assurance System – (this document) incorporated into Tango’s “Software Methodology” document; details the corporate quality policy and structure of the Company and references appropriate Operating Procedures. This document is the responsibility of the President, who acts as the company’s Quality Manager.
- Level 2: Operating Procedures - these are project-specific documents that describe the process details for activities concerned with the attainment of a quality assured contracting service. These documents are the responsibility of the Project Managers and Lead Developers of the various projects.

Any additional specific customer requirements are identified and documented during the contract negotiation and review process, and these requirements are communicated in writing to all affected persons.

#### **5.4 AUTHORITY & RESPONSIBILITIES**

All members of staff have the authority to perform their allocated responsibilities.

All staff shares the authority and responsibility of identifying non-compliances or possible improvements, and recording these instances such that corrective action can be taken, both to rectify the immediate situation and to prevent recurrence.

##### ***President***

- Function as the company's Quality Manager
- Annual review, update, and approval of the Quality Assurance System
- Continuous reviews of the company's resources to ensure that adequate staff, equipment and materials are available to meet customer requirements.
- Review and approval of all price proposals to customers
- Review and approval of all contracts prior to final signatures
- Establishment of project-by-project requirements for Management Reviews and Design Reviews
- Supplier selection
- Company-level training

##### ***Chief Financial Officer***

- Review and approval of all price proposals to customers
- Review and approval of all contracts prior to final signatures
- Review and approval of all company expenditures

##### ***Contracts/Subcontracts Manager***

- Review and approval of all price proposals to customers
- Review and approval of all company expenditures
- Contract review
- Contract and subcontract management & control
- Purchasing

##### ***Project Manager***

- Contract review
- Project planning and control
- Project-level training

##### ***Lead Developer***

- Contract review
- Design
- Final product
- Configuration management

## **5.5 COMPATIBILITY WITH ISO 9001**

The following items of ISO 9001 are not addressed within the operating procedures, as they are not applicable to Tango:

- Statistical Techniques

## **5.6 MANAGEMENT REVIEW AND INTERNAL AUDITS**

The Quality Manager reviews the suitability and effectiveness of the Quality Assurance System at least once a year. Actions are allocated and recorded to track the development of the Company's Quality Assurance System.

The objectives of Management Review are:

- To establish that the Quality Assurance System is achieving the expected results and meeting the Company's requirements, continuing to conform to the Standard, continuing to satisfy the customers' needs and expectations, and functioning in accordance with the established Operating Procedures.
- To expose irregularities or defects in the Quality Assurance System, identify weaknesses, and evaluate possible improvements.
- To review the effectiveness of previous corrective actions, and to review the adequacy and suitability of the Quality Assurance System for current and future operations of the Company.
- To review the finding of internal/ external audits and identify any areas of recurring problems or potential improvements.
- To review the reports of nonconforming items and trend information to identify possible improvements.

Internal audits of each project's compliance with the Quality Assurance System are undertaken at least once per year.

## **5.7 CONTRACT REVIEW**

Tango offers both custom software solutions and related services to meet each customer's needs. Because of the very wide variation in customers needs, and because Tango does not provide standard off-the-shelf products, prices are separately developed for each customer.

Once a proposal is accepted by the customer, a contract is jointly developed with the customer and critically reviewed. The contract articulates all details of the customer's expectations, and this becomes the controlling document for the project. Tango offers a standard contract but is prepared to use the customer's contract if required by the customer, providing all customer requirements are adequately specified.

The contract is reviewed by the President, Chief Financial Officer, Contracts Manager, and Project Manager prior to signing.

In addition to the initial contract the customer might subsequently request additional work to be undertaken by the Company. In these circumstances the technical scope, cost, and schedule are carefully negotiated with the customer prior to execution, to ensure that no ambiguity exists.

## **5.8 DESIGN CONTROL**

All design activities are strictly controlled by the Lead Developer to ensure that the design complies with customer/contract requirements as well as applicable internal design requirements.

Design activities are planned and normally executed by the Lead Developer and his/her staff. Designs are reviewed by the Project Manager and possibly the President and, where relevant, the Customer.

The design is documented in a series of documents that are described under “Project Phases, Tasks, and Deliverables.”

Validation of the design is achieved during system acceptance to confirm compliance to the customer's requirements.

All changes to the design are subject to strict Configuration Management practices.

## **5.9 DOCUMENTATION AND CHANGE CONTROL**

The Quality Assurance System and its parent document, Software Development Procedures, are controlled by the President.

All project-related documentation is controlled through Tango's Configuration Management practices to ensure that it is issued to the appropriate personnel, under the correct level of authority, is revised and reissued as necessary, and all obsolete versions are removed from the point of use.

Each project has a contract file, which contains all relevant information. To the extent possible, this information is held on the company's computer system for ease of access and manipulation.

## **5.10 PURCHASING**

Suppliers of products, materials and services, where unspecified by a customer contract, are selected on their ability to meet the company's requirements given due consideration to the quality, statutory obligations, timescale and cost. A list of approved suppliers and subcontractors is maintained by the Contracts/Subcontracts Manager and is compiled on the following criteria:

- Previous performance in supplying to similar specifications and requirements.
- Stocking of high volume standard items conforming to a relevant standard, or supplied with a statement of conformity.
- Compliance with an approved third party product/ quality registration scheme.
- Recommendation by other similar purchasers or manufacturers of equipment.
- A trial order and evaluation of performance.

All supplies and subcontracts are subject to an authorized Purchase Order providing full clarification of the type and extent of supply.

Should a supplier, not appearing on the Approved Suppliers List be proposed, they are analyzed by capability and subject to acceptance by the President.

### **5.11 CUSTOMER-SUPPLIED ITEMS**

Goods received from customers (i.e. free issue items or equipment being serviced) are always visually inspected at the receipt stage, with any un-declared non-conformance being immediately reported to the customer.

### **5.12 PROCESS CONTROL**

All productive work is planned and undertaken in accordance with the company's procedures, and any specific documents agreed for individual contracts (e.g. contract specifications).

### **5.13 NON-CONFORMING ITEMS, PREVENTIVE AND CORRECTIVE ACTION**

Regarding receipt of supplies, materials, and services from suppliers and subcontractors: once non-conforming items have been noticed they are identified by location, associated documents, or specific markings to prevent their inadvertent use. All non-conforming items and customer complaints are subject to review and rectification by assigned personnel. The type and extent of non-conformity is documented in order to establish trends and identify possible areas for improvement.

The corrective action required to prevent recurrence is evaluated, documented, and its effective implementation is monitored. All rectification is subsequently re-inspected.

All employees are encouraged to suggest improvements in methods, materials, suppliers, and subcontractors.

### **5.14 RECORDS**

Storage facilities are allocated which ensure that all stored records are identifiable and retrievable, and the storage areas are free from damp and other agents, which could cause premature deterioration.

Records that are maintained on computer media are subject to "back-up" at regular intervals, with the "back-up" information being stored in a protected location to ensure security from loss/ damage of active data.

All records are retained for a minimum of 2 years.

### **5.15 TRAINING**

Tango recruits employees capable of meeting the technical, skill, experience and educational requirements of the company's activities. The policy of the company is to ensure that all personnel are trained and experienced to the extent necessary to undertake their assigned activities and responsibilities effectively.

All staff and senior employees are responsible for recommending the training needs of others, and for ensuring that all employees allocated specific tasks are suitably qualified and experienced to execute those tasks. Training needs are identified to each employee in writing by his/her supervisor. Full records are maintained of all training undertaken by employees.

### **5.16 SERVICING**

Maintenance, enhancements, and technical support are offered to all customers; these activities are controlled in the same manner as Process Control.