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## **BDS Seller Special Tooling Requirements**

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# 1. Introduction and General Requirements

## 1.1 Introduction

This document supplements and clarifies established special tooling (ST) requirements contained in D6-82479, *Boeing Quality Management System Requirements for Suppliers, Appendix A: AS9100 Rev B, Quality Management Systems – Aerospace – Requirements*; AS9102, *Aerospace First Article Inspection Requirement*; and Federal Acquisition Regulation, Part 45, *Government Property*.

This document does not address, nor is it intended to contradict, the Property Management requirements for ST. Seller shall address any conflict of requirements with the Boeing procurement representative.

ST types (subcategories of special tools, not to be confused with property management special test equipment) that are excluded from this document include

1. Test equipment (e.g., pressure test, continuity check, and software test tools).
2. Overhead Mechanical Handling Equipment.

## 1.2 General Requirements

This document applies to all Government-owned accountable to Boeing ST (hereafter referred to as Government) and Boeing-owned ST used by Seller and its subcontractors in the performance of purchase contracts from Boeing Defense Space and Security (BDS)..

When imposed contractually, Seller shall comply with the requirements of this document. Seller shall maintain adequate documented procedures and training to implement and maintain these requirements.

Seller is responsible for subcontractor conformance and shall flow the requirements of this document to its subcontractors with ST responsibilities.

Boeing reserves the right to conduct surveillance at Seller's facility to determine Seller's compliance to the requirements of this document. Boeing also reserves the right to make the final determination of the Seller's ST engineering definition, fabrication, acceptance, maintenance, inspection, and usage capability.

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## 1.3 References

D6-82479, *Boeing Quality Management System Requirements for Suppliers*

D6-51991, *Quality Assurance Standard for Digital Product Definition at Boeing Suppliers*

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## 2. Definitions of General Terms

**Configuration Alignment:** The scheduling of ST events supporting effectivity or incorporation point integration.

**Configuration Management:** A management process for establishing and maintaining ST function and performance with its requirements, design, and use throughout the tool life cycle. The process begins with initial documentation of requirements and continues through excess of the ST.

**Media of Inspection (MOI):** ST designated for use in verifying that features or characteristics of parts or assemblies are in compliance with engineering definition requirements.

**Periodic Inspection:** ST inspections (visual and/or physical) performed and recorded on a prescribed inspection plan at a periodic interval.

**Potential Product Impact (PPI):** A process of ST nonconformance analysis for the potential impact to product features established or checked by the ST that may result in nonconforming product.

**Serviceability:** In good working condition, without damaged or missing components, excessive wear, or other conditions preventing ST from performing its intended function.

**Special Tooling (ST):** Jigs, dies, fixtures, molds, patterns, other equipment and manufacturing aids, all components of these items, and replacement of these items, which are of such a specialized nature that without substantial modification or alteration their use is limited to the development or production of particular services or parts thereof or to the performance of particular services. It does not include material, special test equipment, facilities (except foundations and similar improvements necessary for installing special tooling), general or special machine tools, or similar capital items.

**ST Code:** A designator, typically a prefix of the ST number, used to describe the ST type.

**ST Specification:** A document containing specific requirements for the engineering definition, fabrication, inspection, and maintenance of ST. Typically authored by Boeing and provided to Seller for the purpose of identification of critical functionality.

**ST Validation:** Process of validating ST functions properly and as intended. ST validation consists of three types: minor validation; major validation assembly ST, and major validation fabrication ST. (See section 8 for details of each type.)

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## **3. ST Categories, MOI Definitions, and Inspection Requirements**

### **3.1 ST Category I**

Program master tools, which typically include reference tools and tooling data, which establish or control production tools.

Periodic Inspection Requirement: Visual inspections performed at each use. No special inspection records required or as required by ST engineering definition.

### **3.2 ST Category II**

Production end-item feature controlling ST or check fixture including interchangeable/replaceable interface or production interface features where no other means of inspection are performed. This category contains MOI ST. All ST used to accept product or processes shall have evidence of acceptance prior to use.

#### **3.2.1 MOI Type 1**

Designation indicating major end-item ST where ST degradation to the initial build can only be determined via physical measurement or master tool coordination (typically previously referred to as: recycle, routine, or periodic inspections).

Periodic Inspection Requirement: Physical measurement or coordination to a program master tool (Category I) and visual inspection that shall be recorded on a prescribed inspection plan at a periodic interval.

#### **3.2.2 MOI Type 2**

Designation indicating basic end-item tools where tool degradation to the initial build can be verified via visual inspection.

Periodic Inspection Requirement: Visual inspections that shall be performed and recorded on a prescribed inspection plan at a periodic interval.

### 3.3 ST Category III

Category III includes ST other than those tools covered by Categories I and II.

Periodic Inspection Requirement: Visual inspections that shall be performed at each use, separate records are not required (manufacturing work instructions establish the record).

If Seller has any questions regarding ST category designation or MOI type designation, contact Boeing for clarification.

<b>Table 1 ST Category Description and Inspection Requirement Summary</b>		
<b>ST Category</b>	<b>Description</b>	<b>Periodic Inspection Requirement</b>
Category I	Program master tools, which typically include reference tools and tooling data that establish or control production tools.	Visual at each use, no special records required or as identified in ST definition.
Category II	Production end-item feature controlling tools or check fixtures including interchangeable/replaceable interface or production interface features where no other means of inspection are performed. This category contains MOI tools.	See MOI types.
MOI Type 1	Major end-item tools where tool degradation to the initial build can only be determined via physical measurement or master tool coordination and visual inspection (typically recycle, routine, or periodic inspections).	Physical measurement or coordination to a master tool (Category I), recorded on a prescribed inspection plan at a periodic interval.
MOI Type 2	Basic end-item tools where tool degradation to the initial build can be verified via visual inspection.	Visual inspection, recorded on a prescribed inspection plan at a periodic interval.
Category III	ST not covered by Categories I and II.	Visual at each use, separate records not required (manufacturing work instructions establish the record).

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## 4. Seller ST Capability

### 4.1 Scope

This section defines a consistent method of determining the technical capability of a Seller relative to the ST engineering definition, fabrication, acceptance, maintenance, inspection, and usage.

### 4.2 Requirements

- A. Seller's capabilities to perform necessary elements of ST management throughout the life cycle of ST shall be evaluated, assessed, and tracked by Boeing. Seller's subcontractors capability determination shall be the responsibility of the Seller and shall be in compliance with this document. Seller shall demonstrate to Boeing with objective evidence seller's subcontractor controls are adequate with regard to ST capability and compliance evaluations,
- B. Seller shall be required to demonstrate proficiency to Boeing using the capability requirements defined in Table 2, Seller Capability Level and Requirements, and any specific ST requirements defined in purchase contract, before performing a function listed below:
  - 1. ST engineering definition. (reference section 6)
  - 2. ST fabrication, rework, or modification. (reference section 7)
  - 3. ST physical measurement or coordination. (reference section 10)
  - 4. ST visual inspection. (reference section 10)
  - 5. ST each use condition check. (reference section 9)
- C. Seller and its subcontractors shall maintain the appropriate organizational structure, staffing levels, training, processes, procedures and equipment to adequately perform at the designated level of capability. Seller is required to communicate to Boeing for evaluation of capability impact when changes to Seller's organizational structures, staffing levels, training, processes, procedures or equipment occur.
- D. If Seller or its subcontractors are not capable of performing a required function, Seller shall contact Boeing for resolution.

**Table 2 Seller Capability Level and Requirements**

<b>Seller Capability Level</b>	<b>ST Engineering definition</b>	<b>ST Fabrication, rework, or modification</b>	<b>ST Physical measurement</b>	<b>ST Visual inspection</b>	<b>ST Each use condition check</b>
<b>Capability Requirement</b>					
<b>Tool Engineering Organization</b>	X				
Procedures/specifications	X				
Drawing/computer-aided design system	X				
Documented ST engineering definition release/delivery process	X				
Personnel/training	X				
<b>Tooling Organization</b>		X	X		
Procedures/specifications		X	X		
Equipment/certification		X	X		
Personnel/training		X	X		
<b>Tooling Quality Organization</b>		X	X		
Procedures/specifications		X	X		
Configuration control process		X	X		
Equipment/certification		X	X		
Personnel/training		X	X		
<b>Equipment Maintenance Organization</b>				X	
Procedures/specifications				X	
Equipment/certification				X	
Personnel/training				X	
<b>Production Users Organization</b>				X	X
Procedures/specifications				X	X
Personnel/training				X	X
<b>Production Quality Organization</b>				X	X
Procedures/specifications				X	X
Configuration control process				X	X
Personnel/training				X	X
<b>Records</b>		X	X	X	X
Method of controlling		X	X	X	X
Accountability/retention		X	X	X	X
<b>Equipment</b>		X	X	X	
Basic maintenance		X	X	X	

<b>Table 2 Seller Capability Level and Requirements</b>					
<b>Seller Capability Level</b>	<b>ST Engineering definition</b>	<b>ST Fabrication, rework, or modification</b>	<b>ST Physical measurement</b>	<b>ST Visual inspection</b>	<b>ST Each use condition check</b>
Precision measurement		X	X	Tailored	
Computer-aided manufacturing/digital measurement		X	Tailored		
<b>ST Processes</b>		X	X		
Welding		Tailored			
Nondestructive inspection		Tailored	Tailored		
Digital measurement		Tailored	Tailored		
Machining		Tailored			
Plastic/composite tooling		Tailored			
Tailored: custom process and capability based on ST type/features					
X: Seller must demonstrate all identified criteria before being deemed capable at that level					
<p><b><u>How to read table</u></b></p> <p>Top row defines level of capability</p> <p>Left Column defines requirements to meet capability levels</p> <p>Seller uses this table to understand what seller will be required to demonstrate to be deemed capable at a given level</p> <p>Boeing will evaluate seller against this table based on:</p> <ol style="list-style-type: none"> <li>1) responsibilities defined by contract</li> <li>2) capability negotiated between Boeing and seller</li> <li>3) capability desired by seller</li> </ol>					

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## **5. Configuration Management**

### **5.1 Scope**

This section defines configuration management requirements relative to ST. It covers all categories of Government- and Boeing-owned ST involved with the manufacture of parts/assemblies in possession of a Seller or part/assembly installations by the Seller.

### **5.2 Requirements**

Seller shall ensure that all ST is at the designated configuration levels/revisions for the part or assembly being produced, or the installation being performed. When appropriate, Seller shall initiate coordination and negotiation with an authorized Boeing procurement representative for proper configuration alignment.

#### **5.2.1 Boeing-defined ST**

Seller shall implement, at the designated effectivity or incorporation point, Boeing-initiated ST configuration levels/revisions including ST engineering definition, ST usage instructions, and ST inspection instructions.

#### **5.2.2 Seller-defined ST**

Seller shall ensure configuration levels/revisions are integrated into the ST family to support the designated effectivity or incorporation point.

#### **5.2.3 Boeing Fabricated, Reworked, and Modified ST**

Seller, upon notification of a configuration revision, shall develop a plan that meets tool recall requirements and configuration level revision incorporation at the designated effectivity or incorporation point.

#### **5.2.4 Seller Fabricated, Reworked, and Modified ST**

Seller shall, based on capability level, initiate actions to incorporate appropriate configuration levels/revisions into ST at the appropriate effectivity or incorporation point. Seller shall initiate coordination and negotiation with an authorized Boeing procurement representative for proper configuration alignment.

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### **5.2.5 Seller Periodic Inspections and ST Acceptance**

- A. Seller shall ensure the correct configuration of ST, including multi-configuration capable ST, is used during the manufacture of Government and Boeing products.
- B. When configuration alignment issues arise during periodic inspection and ST acceptance, Seller shall immediately notify Boeing to initiate resolution.
- C. When necessary, Seller shall initiate a nonconformance and identify, document, and segregate the ST from manufacturing use until a resolution or alternative method is authorized in accordance with this document. When correction of nonconformance exceeds Seller capability, Seller shall contact Boeing for resolution.

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## 6. ST Engineering Definition

### 6.1 Scope

This section addresses ST engineering definition requirements for Government- and Boeing-owned Seller-defined ST. It provides Seller requirements for the creation of initial and revised ST engineering definitions including all media forms (e.g., text files, 2D drawings, 3D models, data sets, numerically controlled programs).

### 6.2 Requirements

- A. Seller shall be capable of creating initial and revised ST engineering definition.
- B. The ST initial and revised definitions shall conform with controlled product engineering definition.
- C. Sellers using digital product definition data for any phase of ST definition, fabrication, rework, modification, and acceptance (including the use of digital product definition with computer measurement systems) shall meet the requirements of D6-51991, *Quality Assurance Standard for Digital Product Definition at Boeing Suppliers*.
- D. Seller shall obtain Boeing approval for Category I and II ST engineering definitions and any revisions.
- E. ST engineering definition must be capable of providing adequate requirements to configure an ST for its intended function.
- F. All ST requires a process plan/order (work authorization) for all initial ST engineering definitions and revisions. Work authorization may be provided by Boeing or Seller.
- G. The initial and revised ST engineering definition history must be recorded and retained as defined by Seller processes.
- H. Seller shall produce and maintain ST engineering definitions in compliance with all ST specification requirements as required. Requirement revisions must be approved by Boeing and made available upon request.
- I. ST specification (engineering definition requirement) is generated when
  - 1. The ST produces or supports an end item.
  - 2. The ST interfaces with other major ST.

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3. The ST product interfaces with ST at Boeing.
  4. Technical or program requirements for interface, fit-up, or structural integrity warrant it, regardless of the above.

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## 7. ST Fabrication, Rework, and Modification

### 7.1 Scope

This section defines Seller requirements for Seller performed fabrication, rework, and modification of Government- and Boeing-owned ST.

### 7.2 Requirements

- A. Seller shall be deemed capable by Boeing prior to performing fabrication, rework, and modification.
- B. All ST requires a work authorization (process plan/order) for all fabrication, rework, and modification. Work authorization shall be provided by Boeing or Seller when authorized by contract.
- C. Seller shall maintain the following:
  - 1. Documented fabrication, rework, and modification processes and procedures.
  - 2. Certified equipment, including computer measurement systems (CMS). For CMS not D6-51991 qualified, see section 8.2.B for minimum requirements.
  - 3. A trained/skilled workforce.
  - 4. Records accountability and retention of Boeing authorization to perform fabrication, rework or modification (in accordance with applicable contract requirements).
- D. ST will be fabricated, reworked, and modified in conformance with the controlled ST engineering definition and/or product engineering definition.
- E. Seller shall maintain ST fabrication, rework, and modification records.
- F. When Seller is not capable of performing fabrication, rework, and modification, Seller shall take the appropriate actions to ensure work is accomplished. Typical options include
  - 1. Shipping ST to Boeing for fabrication, rework, and modification.
  - 2. Fabrication, rework, and modification performed by Boeing at Seller's site.
  - 3. Third-party fabrication, rework, and modification arranged by Seller meeting the capability requirements of section 4. If tool inspection is delegated, this must be in compliance with section 8 of this document (excluding Boeing

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capability assessment, the Seller is responsible for having a documented process and determining third-party capability when engaging a third party) and any applicable Boeing contractual requirements.

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## 8. ST Acceptance

### 8.1 Scope

This section defines ST acceptance requirements for Seller and its subcontractors when fabricating, reworking, or modifying Government- and Boeing-owned ST.

### 8.2 Requirements

- A. Seller shall be deemed capable by Boeing prior to performing acceptance of ST fabrication, rework, and modification.
- B. When using computer measurement systems (CMS) and equipment for ST acceptance, the Seller and its subcontractors must have processes and documented procedures that provide adequate training and procedural methods to perform acceptance on measurements. These must include at a minimum, but are not limited to:
  - 1. Create acceptance criteria used by operator and quality assurance.
  - 2. Develop and use of scale factors to compensate measurements for coefficient of thermal expansion and to verify accuracy.
  - 3. Establish, transform, and manipulate coordinate systems.
  - 4. Establish data collection parameters and requirements.
  - 5. Establish special targeting and target adapter requirements.
  - 6. Equipment handling, equipment setup, multi-stations setup, field checks, and calibrations.
  - 7. Data analysis, format, storage, and reporting.
- C. Seller shall maintain an ST fabrication, rework, or modification inspection record, which includes at a minimum:
  - 1. ST identification.
  - 2. ST definition.
  - 3. ST feature, dimension, and process inspection results.
  - 4. ST fabrication, rework, and modification/configuration history, which must include relevant authority documentation.

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5. ST inspection/release status.
  6. ST validation.
- D. Seller shall apply one of the following ST validation types as part of ST acceptance:
1. **Minor Validation:** The most common process. Typically occurs when manufacturing uses a new or revised ST for the first time as defined in manufacturing work instructions. Typically applied to low-risk ST of basic to moderate complexity and may or may not control product configuration. The ST is unconditionally released for production use upon completion of tool fabrication and acceptance. Should ST users encounter issues, the Seller's normal ST support process applies.
  2. **Major Validation Fabrication Tools:** Process applied to tools that are designed or fabricated with intentional compensation from product nominal definition to accommodate manufacturing or material processing phenomena such as spring back or thermal behaviors. The tool is typically fabricated to definition requirements, accepted, and conditionally released for manufacturing use. The initial product of the tool is independently inspected to validate the tool produces acceptable product. Once an acceptable product is produced, the tool is unconditionally released for production use.
  3. **Major Validation Assembly Tools:** Process typically applied to large complex assembly jigs and typically consists of streamlined forms for collecting issues identified during initial use and inspections. The tool is typically fabricated to definition requirements, accepted, and conditionally released for manufacturing use. Validation period may include more than one usage to verify the tool produces a part or assembly to product requirements. ST MOI type 1 periodic inspections may be conducted after production assemblies are produced to demonstrate tool stability (typically applied to very large assembly jigs that may experience foundation settling, base and end-gate settling, etc).
- E. Boeing reserves the right to determine the ST validation type. Should Seller have questions regarding selecting the appropriate ST validation level, contact Boeing for resolution.
- F. Boeing reserves the right to verify initial ST setup for major assembly tooling. Seller shall contact Boeing prior to setup.
- G. Seller shall demonstrate acceptance evidence of ST by one of the two methods:
- 1) Physically on ST
  - 2). An alternate method containing the following characteristics

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- a. Acceptance data is readily accessible
  - b. Acceptance data is traceable to the ST
  - c. Data indicates date of acceptance
  - d. Data indicates authorized acceptance personnel
  - e. The alternate method is documented

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## 9. Each Use Condition Check

### 9.1 Scope

All Government- and Boeing-owned ST requires each use condition checks prior to each usage.

### 9.2 Requirements

- A. A special tool shall only be used for the specific purpose for which it was intended.
- B. Users shall, in their areas of responsibility, ensure that ST functions correctly and is properly maintained.
- C. Typical areas of consideration during each use condition check include but are not limited to the following:
  - 1. ST is properly identified and identification is legible.
  - 2. An acceptance stamp is on the identification tag or near the ST identification.
  - 3. The ST engineering definition/configuration level is identified.
  - 4. The instruction, direction, and caution/safety tags are securely attached and legible when applicable.
  - 5. All ST details/parts are available and in good condition:
    - a) “L” pins, hand knobs, scribes, step pins, etc. are in good condition.
    - b) Rubber cushions and protective pads are secure and in good condition.
    - c) Toggle clamps, straps, and other hold-down devices are in good condition.
    - d) There are no loose, cracked, or missing bushings.
    - e) There is no evidence of mushroom, damaged edges, or surfaces on part or assembly locating surfaces.
    - f) There is no corrosion or contamination on any part/assembly locating surfaces.
  - 6. Drill indicators, index holes, and surface stamping are clear and legible.

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7. There is no obvious degradation of tamperproof measures.
- D. Any discrepancies found during each use condition check shall be properly documented and addressed in accordance with Seller's documented maintenance and/or nonconformance processes.

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## 10. Periodic Inspection

### 10.1 Scope

This section covers all Government- and Boeing-owned Category II ST used to produce Government and Boeing products.

### 10.2 Requirements

- A. All Category II ST requires periodic inspections in addition to each use condition checks.
- B. Seller and its subcontractors shall maintain a list of all Category II ST used to produce Government or Boeing products. The list shall include the following:
  - 1. Government- and Boeing-owned ST supplied by Boeing.
  - 2. Government- and Boeing-owned ST provided by a Seller.
- C. When Seller has demonstrated capability to Boeing to perform periodic inspections, the following requirements apply:
- D. Seller shall maintain specific inspection instructions, including initial interval between inspections (Boeing- or Seller-provided) instructions, by ST number, for the specific features to be verified during the periodic inspection of the tool. In addition to specific features being verified, the following are typical areas considered during periodic inspections:
  - 1. The tool is properly identified and identification is legible.
  - 2. An acceptance stamp is on the identification tag or near the tool identification.
  - 3. The instruction, direction, and caution/safety tags are securely attached and legible, when applicable.
  - 4. All ST details/parts are available and in good condition:
    - a) “L” pins, hand knobs, scribes, step pins, etc. are in good condition.
    - b) Rubber cushions and protective pads are secure and in good condition.
    - c) Toggle clamps, straps, and other hold-down devices are in good condition.
    - d) There are no loose, cracked, or missing bushings.

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- e) There is no evidence of mushroom, damaged edges, or surfaces on part or assembly locating surfaces.
  - f) There is no corrosion on any part/assembly and no contamination impacting the function of the ST..
5. Drill indicators, index holes, and surface stamping are clear and legible.
  6. There is no obvious degradation of tamperproof measures.
  7. There is verification that the ST is at the correct configuration for its intended use in accordance with the tool usage instructions and/or manufacturing plan.
  8. There is visible evidence on the ST of its acceptance status.
- E. Any discrepancies found during periodic inspections shall be properly documented and addressed in accordance with Seller's documented maintenance and/or nonconformance processes.
- F. Seller shall maintain the results of preceding and current periodic inspections of Category II tools. The record shall include
1. Dimensions/features verified during the periodic inspection, including actual values or coordination to Category I ST.
  2. The date of the periodic check.
  3. The inspection authority of the individual who performed the check.
  4. The date of the next scheduled periodic check (expiration date).
  5. ST engineering definition used as inspection requirement.
  6. Verification of configuration level.
  7. Identification of the acceptance status of the ST.
- G. Seller shall maintain a copy of all completed periodic inspection documentation and forward a copy to Boeing upon request.
- H. Seller shall apply an easily recognizable indication (e.g., label) to the tool that bears the expiration date, acceptance status, and inspection authority of the individual applying the indicator.
- I. At a minimum, Seller shall conduct periodic inspections every 12 months for Category II ST in use until sufficient data is available to adjust the frequency of inspection.

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- J. Seller shall review the interval of periodic inspections for adequacy and adjust intervals accordingly. Increasing or decreasing the interval shall be accomplished using statistical methods and historical periodic inspection data.
  - K. Changes to the MOI designation and periodic inspection interval shall be communicated to Boeing (when Seller-initiated) and the Seller (when Boeing-initiated).
  - L. When Seller is not capable of performing periodic inspections, Seller shall take the appropriate actions to ensure inspections are accomplished. Typical options include
    - 1. Shipping ST to Boeing for inspection.
    - 2. An inspection performed by Boeing at Seller's site.
    - 3. Third-party fabrication, rework, and modification arranged by Seller meeting the capability requirements of section 4. If tool inspection is delegated, this must be in compliance with section 8 of this document (excluding Boeing capability assessment, the Seller is responsible for having a documented process and determining third-party capability when engaging a third party) and any applicable Boeing contractual requirements.

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## 11. ST Data Elements

### 11.1 Scope

This section applies to all Government- and Boeing-owned ST. Data package elements enable Boeing and Seller to identify, define, use, and periodically inspect ST at Seller facilities.

### 11.2 Requirements

The following are data requirements for ST identification, engineering definition (e.g., drawings, models, digital data, etc.), usage instructions, and inspection instructions. Based on the data element change to the ST, Seller shall take appropriate action.

#### 11.2.1 ST Specification/Engineering Definition Requirements

Seller shall integrate and incorporate ST specification/engineering definition (Boeing- or Seller-defined), original and change data, as appropriate, including ST category and MOI type.

#### 11.2.2 ST Identification

- A. ST identification must meet contract requirements.
- B. The ST identification and changes typically include but are not limited to the following:
  - 1. ST code.
  - 2. The basic engineering part or production assembly number.
  - 3. Boeing lifetime serial number, when applicable.
  - 4. ST unit/duplicate (dup) number, when applicable.
  - 5. Once an ST is accepted for production use, the ST number (item 1 & 2 above) shall not be changed without notification to Boeing.
  - 6. Loose/removable ST components must be traceable back to the parent tool.
  - 7. Additional information may be required by contract or property requirements.

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### 11.2.3 ST Usage Instructions

- A. ST usage instructions are intended to provide additional information for ST users. They are typically provided when ST is highly complex, have critical indexing methods, have multiple configuration settings, or when usage cannot be easily communicated on the ST or within the manufacturing work instructions.

#### 1. Seller-defined

- a) Seller-defined ST usage instructions, including revisions, shall be flowed to the users of tools within Seller's manufacturing work instruction method.
- b) Seller shall maintain ST usage instructions to the appropriate configuration effectivity/level and make them available to Boeing upon request.
- c) Seller shall maintain a record of all changes to Seller-defined Category II ST usage instructions and shall make them available to Boeing upon request.

#### 2. Boeing-defined

- a) Seller shall flow Boeing-provided ST usage instructions including revisions to the tool users through Seller's work instruction methods.
- b) Seller requested ST usage instruction changes shall be submitted to Boeing for review and approval prior to incorporation.

### 11.2.4 ST Inspection Instructions

- A. ST inspection instructions are intended to provide periodic inspection requirements for Seller and are typically provided for Category II MOI Type I ST.

#### 1. Seller-defined

- a) Seller-defined ST inspection instructions of Category II ST and any documentation changes shall be approved by Boeing.
- b) Seller shall maintain tool inspection instructions to the appropriate configuration level and make them available to Boeing upon request.
- c) Seller-defined tool inspection instructions shall be flowed to users performing periodic tool inspections, including Seller's subcontractors.

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## **2. Boeing-defined**

- a) Seller shall flow the Boeing-defined inspection instructions to users performing periodic tool inspections, including Seller's subcontractors.
- b) Seller-requested tool inspection instruction changes shall be submitted to Boeing for review and approval prior to implementation.
- c) For Boeing-defined Government- and Boeing-owned Category II ST where no inspection instructions have been provided, Seller shall contact Boeing for resolution.

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## **12. Manufacturing Work Instructions**

### **12.1 Scope**

This section covers all categories of Government- or Boeing-owned ST involved with the manufacture of Government or Boeing products. It defines Seller requirements for Seller manufacturing work instructions or plans that require usage of ST.

### **12.2 Requirements**

- A. Seller shall ensure ST used for the manufacture of Boeing products is documented on appropriate Seller's and its subcontractors' manufacturing work instructions.
- B. When separate ST usage instructions exist, Seller shall include in the manufacturing work instructions a reference to the ST usage instructions and make them available to users.
- C. Seller shall ensure ST is used in accordance with Seller work instructions and ST usage instructions.
- D. When compliance issues or Seller methods and processes come into conflict with the ST engineering definition, Seller manufacturing work instructions, ST usage instructions, or configuration alignment, Seller is required to follow its nonconformance/corrective action process and contact Boeing for coordination.

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## 13. First Article Inspection and ST Relationship

### 13.1 Scope

This section covers Government- and Boeing-owned ST as related to First Article Inspection (FAI) of parts or assemblies. The FAI requirements shall continue to apply even after initial compliance.

### 13.2 Requirements

- A. ST used during FAI for product acceptance must show evidence of acceptance status prior to use.
- B. The following ST-related events shall require a partial or complete re-accomplishment of the FAI for the subject part or assembly:
  - 1. ST engineering definition, including ST coded N/C programs changes potentially affecting fit, form, or function of parts or assemblies.
  - 2. Manufacturing changes to ST configuration controlling or verifying features potentially affecting fit, form, or function of the product.
  - 3. Natural or man-made disaster (e.g., earthquake, flood, tornado) where ST is potentially affected.
- C. ST related events that do not invoke the FAI process include the following:
  - 1. ST maintenance (e.g., cleaning, dressing index features, replacement of pins, etc.).
  - 2. Returning ST to previously accepted definition configuration.
  - 3. ST definition revisions or modifications to ST features not affecting configuration of part or assembly (e.g., lightening holes, clearance issues, operator access issues, etc.).

#### 13.2.1 Communication Requirements

- A. When Boeing initiates actions that require a partial or complete re-accomplishment of FAI due to ST-related events, the requirements shall be communicated to Seller. Seller is required to communicate the requirement to any affected Seller's subcontractors.

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- B. When Seller initiates actions that require a partial or complete re-accomplishment of FAI due to ST-related events, Seller shall communicate with Boeing prior to implementation for Boeing determination/approval and coordination of appropriate FAI actions.

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## 14. ST Maintenance

### 14.1 Scope

The section covers the scope of ST maintenance, which includes all Government- and Boeing-owned ST in Seller's and its subcontractors' possession. Normal wear is expected during ST use, and maintenance is expected. The basic elements of ST maintenance are each use condition checks and periodic inspections.

Unless specified in the purchase contract, Seller shall only be responsible for rework to ST resulting from excessive wear, damage, or inappropriate storage. Any deviation or exceptions will be subject to negotiation between Boeing procurement agent and Seller.

### 14.2 Requirements

- A. Seller shall have a documented ST maintenance process and Seller shall keep ST in a serviceable condition.
- B. Seller shall monitor ST features for excessive wear and take actions to address worn ST before the ST becomes nonconforming to ST definition requirements.
- C. At a minimum, Seller shall place special emphasis on ST used in situations that may subject the ST to excessive wear. These situations include but are not limited to
  - 1. Exposure to cutting (e.g., routing, drilling, reaming) cycles.
  - 2. Exposure to force and load cycles.
  - 3. Exposure to vibration, striking, or impact cycles.
  - 4. Exposure to thermal cycles.
  - 5. Exposure to chemicals and fluids.
  - 6. Exposure to corrosive environment.
- D. ST features may become damaged or lost during normal usage (e.g., pins, clips, clamps, pads, removable components, etc.). Seller shall establish and maintain a process to minimize damage or loss, and take actions to maintain, repair, or replace ST damaged or lost features. Any discrepancies found during ST maintenance shall be properly documented and addressed in accordance with Seller's documented maintenance and/or nonconformance processes.
- E. Seller shall notify Boeing immediately when normal wear or nonconformance conditions exceed Seller capability for correction.

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- F. Seller shall notify Boeing in a timely manner when ST approaches end of useful life to ensure resolution is addressed before impacts to the product quality or deliveries occur.

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## 15. ST Protection

### 15.1 Scope

This requirement is applicable to all Government- and Boeing-owned ST in Seller's and its subcontractors' possession. The requirement is effective for ST in use or not in use.

### 15.2 Requirements

All ST shall be appropriately protected to prevent loss, theft, damage, and deterioration.

#### 15.2.1 ST in Use

- A. ST in Seller's possession shall be protected from undue damage and deterioration including inappropriate exposure to the elements. When required, ST will have an appropriate preservative applied to prevent corrosion.
- B. Prior to each use, users shall review the ST usage instructions for serviceability. Any conditions hindering fit, form, function, or tool performance shall be addressed through Seller's ST maintenance process up to possible nonconformance documentation.

#### 15.2.2 ST not in Use

- A. ST not in use or stored by Seller shall be controlled in a fashion and in facilities adequate to prevent loss, theft, damage, and deterioration. Measures shall be taken to apply an appropriate preservative and to protect ST from the elements.
- B. Seller's storage requirements shall include periodic preservation / condition checks for all tools in storage.

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## **16. ST Nonconformance**

### **16.1 Scope**

This section covers all categories of Government- or Boeing-owned ST involved with the manufacture of Government or Boeing products. It defines Seller requirements for Seller's ST nonconformance process.

### **16.2 Requirements**

- A. Seller shall ensure that ST is identified and controlled to prevent unintended use. The controls, related responsibilities, and authorities for dealing with nonconforming ST shall be defined in a documented process.
- B. All nonconforming conditions of ST from the controlled ST definition shall be documented in accordance with Seller's nonconformance process.
- C. When nonconformances are found on Category I ST, Seller shall immediately report these to Boeing. The discrepant Category I ST shall not be used until a Boeing disposition is received in writing.
- D. All nonconformance conditions of Category II and III ST shall be addressed at the level of Seller capability. All Category II ST nonconformance dispositions shall be retained by Seller and made available to Boeing upon request.
- E. Nonconforming ST shall not be released for use by Seller's manufacturing organization until the tool is corrected, or an acceptable alternative method has been documented and approved in accordance with Seller's capability and nonconformance process.

### **16.3 Seller ST Nonconformance Reporting to Boeing**

When ST nonconformance information is required to be forwarded to Boeing, it must be in the language and dimensions acceptable to Boeing. The following must be included in the Seller's notification to Boeing:

1. Complete Boeing identification as defined on ST.
2. Location of tool.
3. Clear and concise description of discrepancy.

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## 17. Potential Product Impact

### 17.1 Scope

This section includes all Government-, Boeing- owned ST used to produce Government- and Boeing-owned products.

### 17.2 Requirements

- A. ST discrepancies potentially impacting products shall invoke a potential product impact (PPI) investigation and Seller shall support Boeing with ST event-based PPI investigations.
- B. Seller shall document nonconforming ST within Seller's nonconformance process and identify, document, and segregate nonconforming ST from manufacturing use until ST is corrected or an alternative method is approved.
- C. ST nonconformance types requiring further investigation for potential product impact include but are not limited to the following:
  - 1. A dimension or feature that is significantly out of ST tolerance and results in exceeding product engineering definition tolerances.
  - 2. Damage to the ST.
  - 3. Missing ST details.
  - 4. Missing ST Identification.
  - 5. No evidence of ST acceptance.
  - 6. Missing or altered ST tamper proof measures.

**Note:** Investigation may show that these conditions did not have an adverse effect on the product.
- D. Seller shall contact Boeing upon initiation of potential product investigation and submit investigation results to Boeing.
- E. Seller shall identify the produced products potentially nonconforming as a result of the nonconforming ST (designated by serial number, lot number, date codes, any other available means) and identify (reconfirm) the acceptability of produced products outside the suspect range or, if appropriate, identify (reconfirm) the acceptability of all produced products.
- F. Seller shall report all ST nonconformances potentially impacting product to Boeing including identification, documentation, and segregation of potentially nonconforming products as a result of nonconforming ST. This activity shall

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include products at Seller's and its subcontractors' facilities, and products previously delivered to Boeing.

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## 18. Receiving and Shipping

### 18.1 Scope

This section applies to all receipts and shipments of ST by Seller and its subcontractors. Seller and its subcontractors shall have the following responsibilities to avoid ST loss and damage during receipt and shipment. This applies to all Government- and Boeing-owned ST.

### 18.2 Requirements

- A. Seller and its subcontractors shall comply with the following requirements.
- B. Upon acceptance of receiving verification, all ST and ST data elements will be incorporated into Seller's approved ST control processes for storage, protection, accountability, and use per the requirements of this document.

#### 18.2.1 Receiving

- A. Upon receipt of ST, Seller shall verify the following in accordance with contract requirements:
  - 1. There is no damage and there are no missing details/parts.
  - 2. Serviceable condition.
  - 3. Configuration.
  - 4. Data elements (identification, definition, usage/inspection instructions).
  - 5. Evidence of initial acceptance
  - 6. Periodic inspection release status (when applicable).
- B. Any discrepancies found during receiving shall be properly documented and addressed in accordance with Seller's documented maintenance and/or nonconformance processes including coordination with Boeing.

#### 18.2.2 Shipping

- A. Seller shall use the shipping method called out in the contract, the shipping method as defined in the ST engineering definition, or a method that will ensure ST protection.

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- B. Seller shall obtain appropriate authorization and specific instructions for shipping Category I ST.
- C. Prior to shipping Seller shall:
1. Account for all ST details and parts
  2. Include all required ST data elements
  3. Ensure ST is in serviceable condition
  4. Include evidence of acceptance
  5. Include last periodic inspection evidence (Category II ST)
- D. When ST is not in a serviceable condition or ST details and parts are missing, Seller shall initiate a nonconformance document. Seller shall, prior to shipping, obtain a disposition approved by Boeing or permission from the Government or Boeing, as defined by contract, to ship with an open (no disposition) nonconformance.
- E. Seller shall adequately preserve and protect ST before packaging for shipping.
- F. Seller shall use adequate shoring within or on shipping packaging to protect ST from damage during shipping.
- G. Seller shall contact Boeing for assistance with any shipping questions including but not limited to
1. Details or parts.
  2. Serviceable condition.
  3. Corrosion prevention.
  4. Shoring and protection
  5. All ST engineering definition and appropriate records data.
  6. Appropriate authorization.

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## 19. ST Use for Post-production and Spares

### 19.1 Scope

This section addresses post-production and spares use of ST including all variations of the terms post-production and spares (e.g., fleet modification programs, upgrade programs, service bulletins, warranty programs, maintenance programs, etc.). The scope covers all categories of Government- and Boeing-owned ST used to produce Government or Boeing products under a Boeing post-production or spares contract.

### 19.2 Requirements

- A. Seller shall ensure ST that is defined, fabricated, received, or otherwise provided for the purpose of implementing a post-production or spares program is in compliance with all requirements of this document.
- B. Seller shall confirm the category of tool, including the MOI type, for the purpose of acceptance/inspection requirements and implement required inspections.
- C. For category II ST returning from “inactive to active” or “not in use to in use,” Seller shall notify Boeing of the change for purposes of periodic inspection status alignment between Boeing and Seller.

## Appendix A

<b>Supplier Tooling Requirements Document Map</b>		
<b>D950-11059-1</b>	<b>AS9100</b>	<b>AS9102</b>
Introduction and General Requirements	7.4.1, 7.5.1.4	
Definitions of General Terms		
ST Categories, Media of Inspection Definitions, and Inspection Criteria	7.5.1.3, 7.6	
Supplier ST Capability	6.2.2	
Configuration Management	4.3, 7.5.1.2	
ST Engineering Definition	7.3.7	
ST Fabrication, Rework, and Modification	7.5, 7.5.1.5, 7.5.1.2	
ST Acceptance	7.5.1.3, 7.6	
Each Use Condition Check	7.5.1.3, 7.6	
Periodic Inspection	7.5.1.3, 7.6	
ST Data Elements	7.2.3	
Manufacturing Work Instructions	7.5.1.1	
First Article Inspection and ST Relationship	8.2.4.2	5.3
ST Maintenance	7.5.1.3	
ST Protection	7.6	
ST Nonconformance	7.6	
Potential Product Impact	7.6, 8.5.2	
Receiving and Shipping	7.5.5	
ST Use for Post-production and Spares	Applies as above	

## Appendix B Document Revision Record

Rev	Section	Change	Rationale
A	Table of Contents	Added section 1.3 and appendix B.	Improvement. Standard technique for documenting revisions.
	Definitions	Deleted First Product Inspection, added Periodic Inspection and ST Validation.	Align with IDS common process.
	Section 1	Added new section 1.3, References.	Clarification.
	Section 3; Table 1	Added provision to contact Boeing for clarification; added "periodic" to inspection requirements.	Clarification.
	Section 4, 4.2	Added contract requirement language.	Improvement.
	Section 5, 5.2, 5.2.5	Revised title and paragraph to focus requirement at Seller level and remove from user level.	Align with generally accepted industry practices.
	Section 6, 6.2	Added requirement C.	Improvement.
	Section 7, 7.2	Added delegation requirements statement when using third party.	Clarify requirement specifically for acceptance delegation.
	Section 8, 8.2	Added computer measurement system requirements; added item 7, ST validation paragraphs; deleted FPI language.	Allow usage of advanced measurement equipment without DPD approval. Align with IDS common process.
	Section 9, 9.2	Deleted item 8.	Align with change in 5.2.5.
	Section 10, 10.2	Revised formatting; added change in MOI designation communication requirement; added delegation requirements when using third party.	Clarification.
	Section 11, 11.2.2	Added contract compliance requirement, change requirement; deleted item 8.	Clarification.
	Section 13, 13.2, 13.2.2	Revised wording.	Clarification.
	Section 18, 18.2	Added requirement to enter received ST into Seller's approved control process.	Improvement.
	Section 19, 19.2	Added not in use to in use communication requirement.	Process improvement.
Requirements sections	Added alphabetical identification to each requirement within the section.	Eliminate confusion when referencing a specific requirement.	

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**Revision Letter**  
**Changes in This**  
**Revision**  
**Authorization for**  
**Release**

**A**  
See appendix B.

AUTHOR:	<u>William J. Petry</u>	<u>3H1</u> Org. Number	<u>Sept 17, 2009</u> Date
APPROVAL:	<u>Thomas J. Spiegel</u>	<u>D500</u> Org. Number	<u>Sept 17, 2009</u> Date
DOCUMENT RELEASE:	<u>Ngoc H. Bui</u>	<u>G-823A</u> Org. Number	<u>Sept. 23, 2009</u> Date

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Rev	Section	Change	Rationale
B	Title	Changed IDS to BDS	Update of company business unit name
	Section 1.1	Added AS9100 revision level, Rev B	Clarification
	Section 1.2	Added "accountable to Boeing," and business unit name update	Clarification of applicability to only those Government ST accountable to Boeing
	Section 3.2	Removed must and replaced with shall	Clarification
	Section 4.2.A	Added seller subcontractor controls element	Clarification
	Section 5.2.1	Added instructions behind ST usage	Clarification
	Section 7.2.C.2	Added computer measurement system provision	Clarification
	Section 7.2.C.4	Added authorization requirement	Clarification
	Section 8.2.G	Added alternative method for evidence of acceptance	Alignment with AS9100 Rev B
	Section 11.2.2.B.5	Removed "coordination" and replaced with "notification"	Clarification
	Section 18.2.2.C	Restructured prior to shipping requirements from paragraph to listed requirements	Clarification
	Section 18.2.2.E	Reworded requirement to "adequately preserve and protect"	Clarification

**Revision Letter**

**B**

**Changes in This Revision**

See appendix B.

**Authorization for Release**

AUTHOR:	<u>William J. Petry</u>	<u>3H1</u>	<u>Oct 29, 2010</u>
		Org. Number	Date
APPROVAL:	<u>Thomas J. Spiegel</u>	<u>D500</u>	<u>Oct 29, 2010</u>
		Org. Number	Date
DOCUMENT RELEASE:	<u>Charlene J. Gerken</u>	<u>9M-ST-EUB0</u>	<u>Nov. 2, 2010</u>
		Org. Number	Date

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## Revision Record

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**Revision Letter**

**C**

**Changes in This Revision**

Revised verbiage in Section 10.2 item D. 7.

**Authorization for Release**

AUTHOR:	<u>Albert C Hodge-Jr</u>	<u>GT-01-3H2</u> Org. Number	<u>Nov. 29, 2011</u> Date
APPROVAL:	<u>Joseph K. Lonigro-III</u>	<u>GT-01-3H1</u> Org. Number	<u>Nov. 29, 2011</u> Date
DOCUMENT RELEASE:	<u>Rebecca Byers</u>	<u>9M-ST-EUB0</u> Org. Number	<u>Nov. 29, 2011</u> Date

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## Revision Record

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**Revision Letter**

**D**

**Changes in This Revision**

Added word "technical" to content owner statement on page and also added verbiage on page 1 stating Jeff Webb has RAA for ISE ownership

**Authorization for Release**

AUTHOR:	<u>Albert C Hodge-Jr</u>	<u>GT-01-3H2</u> Org. Number	<u>Feb, 23,2012</u> Date
APPROVAL:	<u>Jeff Webb</u>	<u>HM-01-D50A</u> Org. Number	<u>Feb 23, 2012</u> Date
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