JOHN DEERE

John Deere Standard

JOHN DEERE
Public

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JDS-G223

Supplier Quality Manual — Program Requirements

Table of Contents

List of Tables

List of Figures

1 Scope

1.1 JDS-G223 is intended to be used in compliance with ISO 9001:2015.

1.2 JDS-G223 standard defines the quality management system requirements for the design, development, production, and when applicable, assembly, installation, and services of all John Deere related products.

1.3 Additional information can be found on the John Deere Supply Network (JDSN).

1.4 This standard can contain mandatory provisions, which are identified by the words “shall” or “required”. Compliance with the mandatory provisions is required to claim conformance with this standard. This standard can also contain guideline provisions, which are generally identified by the words “should” or “recommended”. Compliance with the guideline provisions is not required, because they might not be appropriate for all machines or all applications.

2 Terms and Definitions

For the purposes of JDS-G223, the terms and definitions of ISO 9000:2015, and the following apply.

2.1
achieving excellence process
Continuous measuring of a supplier performance, rewarding improvements, and recognizing suppliers' outstanding efforts.

Note 1 The Achieving Excellence process embraces proactive quality planning as a routine part of doing business; and helping suppliers' continuous improvement efforts.

2.2
component reliability assessment
Process which ensures that component reliability goals are set and that plans are created and executed to validate and demonstrate the ability to meet the goals.

2.3
control plan
Documented description of the actions, systems and processes for controlling product required at each phase of the process, ensuring that all process outputs remain in a state of control.

Note 2 The control plan contains documentation of the processes from receiving to shipping, reflecting a strategy which is responsive to changing process conditions, and is maintained and used throughout the product life cycle.

2.4
Cp
Ratio of tolerance to 6 Sigma, or the USL, minus the LSL, divided by 6 Sigma.

Note 3 Sometimes referred to as the engineering tolerance divided by the natural tolerance, and is only a measure of dispersion.

2.5
Cpk
Equals the lesser of the USL minus the mean divided by 3 sigma (or the mean) minus the LSL divided by 3 sigma.

Note 4 The greater the Cpk value, the better.

2.6
Critical Characteristics <CC>
Type of special characteristic which require extra control to prevent safety or compliance related non-conformances.

2.7
Design Process and Assembly Review (DPAR)
Simultaneous engineering process designed to optimize the relationship between design function, manufacturability, and ease of assembly.

Note 5 This process is also referred to as design for manufacturability and assembly

2.8
discrimination
Ability of the gage or measuring equipment to detect and indicate small changes in the measured characteristic.

2.9
engineering deviation
Document required prior to shipment, to record and control the authorization and use of product when part specifications do not comply with John Deere engineering specifications.

Note 6 Also documents a corrective action.

2.10
Enterprise Product Delivery Process (EPDP)
Sequence of processes required to successfully design, test, and produce a product or service which meets or exceeds the expectations of John Deere and our customers.

2.11
Failure Mode and Effects Analysis (FMEA)
Systematic group of activities intended to recognize and evaluate the potential failure of a product, the effects and causes of the potential failure, identify actions which could eliminate or reduce the chance of the potential failure occurring, and document the process.

2.12
gage R&R study
Study which measures the total repeatability and reproducibility (R&R) of a gage system as a percentage of the total specification.

2.13
gage repeatability
Variation in measurements obtained with one measurement instrument, when used several times by one appraiser, while measuring the identical characteristic on the same part.

2.14
gage reproducibility
Variation in the average of the measurements made by different appraisers, using the same measurement instrument, used several times by each appraiser, while measuring the identical characteristic on the same part.

2.15
intellectual property
Creative ideas and expressions of the human mind which have commercial value and receive the legal protection of a property right including but not limited to ideas, inventions, business methods, and manufacturing processes.

Note 7 The major legal mechanisms for protecting intellectual property rights are copyrights, patents, and trademarks.

2.16
John Deere Supply Network (JDSN)
Website which assists John Deere employees and suppliers to manage relationships while providing suppliers with the necessary information and tools to effectively conduct business with John Deere.

2.17
Key Characteristic <KC>
Type of special characteristic that needs extra control to prevent significant warranty, machine downtime, or customer dissatisfaction.

2.18
Materials and Service Acquisition (MaSA)
Process used for establishing confidence that experimental parts are manufactured to engineering specifications.

2.19
Order Fulfillment Process (OFP)
John Deere global process which is designed to deliver the right product at the right place at the right time.

2.20
physical build
Physical model which is used to evaluate the complete product, processes, and tooling during the EPDP.

Note 8 Durability builds and limited production builds are examples of a physical build.

2.21
Pp
Estimate of the capability of a process during the initial set-up (for example, when few data points are available).

2.22
Ppk
Index of process performance to predict the process capability of a process, and to determine how well a system is meeting specifications.

Note 9 Also referred to as the performance index.

2.23
process capability
Range over which the natural variation of a process occurs as determined by the system of common causes.

Note 10 Process capability is comprised of three components: the design tolerance, the centering of the process, and the range or spread of the process variation.

2.24
process control
Monitoring of characteristics for capability to produce a feature under stable conditions to maintain ongoing acceptable quality levels (for example, process sheets, inspection and test instructions, test procedures, standard operating procedures, preventative maintenance instructions, and specific part control plans).

2.25
Process Failure Modes and Effects Analysis (PFMEA)
Systematic group of activities intended to recognize and evaluate the potential failure of a process, the effects and causes of the failure, identify actions which could eliminate or reduce the chance of the potential failure occurring, and document the process.

2.26
process key characteristics
Characteristics which significantly impact the ability of the process to meet specifications, which affect John Deere satisfaction, or which require extra control.

2.27
Production Part Approval Process (PPAP)
Process used for establishing confidence for the parts manufactured by suppliers and the processes utilizes are capable of meeting engineering design intent.

2.28
Product Verification and Validation (PV&V)
Process by which a product is proven to meet the required specification through the use of objective evidence, and a product's features and performance are confirmed to meet John Deere expectations.

Note 11 Also referred to as Design Verification and Validation by AIAG, or Development Verification and Validation by ISO.

2.29
Quality Plan Level (QPL)
Part risk based on cost, severity, and complexity categories ranging from 0 to 4.

Note 12 Each category affects the overall risk of a part or component to John Deere. Quality Plan Level with 4 representing the greatest risk. The required quality activities are identified based on the Quality Plan Level.

2.30
quality record
Records established to provide evidence of conformity to requirements, and the effective operation of the quality management system.

2.31
Risk Priority Number (RPN)
Product of severity, detection, and occurrence in a FMEA.

2.32
special characteristic
Product characteristics or manufacturing process parameters that need special attention or controls to prevent significant impacts to product safety, compliance with government regulations or customer satisfaction. Types of special characteristics include critical and key characteristics.

Note 13 Targeting control is necessary to meet John Deere requirements which directly or significantly impact John Deere satisfaction through compliance with government, country or industry standards and regulations, ability to perform the intended design requirements, or manufacturability and ability to assemble.

2.33
special process
Processes used in the production of products whose quality cannot be fully verified later by non-destructive inspection of the product (for example, welding, painting, heat treat, and plating).

2.34
subcontractor
Suppliers which supply John Deere primary suppliers.

Note 14 Subcontractors are also referred to as second and third tier suppliers, sub tier suppliers, or the supplier's supply chain.

2.35
total variation
Ratio of the uncertainty of the repeatability and reproducibility of the gaging system to the tolerance range of the characteristic to be measured.

2.36
verification warrant
Cover page for the PPAP documents and requires John Deere approval prior to shipping production parts.

2.37
wavelength
Composite analysis of the supplier's initiative, attitude, responsiveness, attention to detail, communications, and performance as evaluated in the Achieving Excellence program.

3 Abbreviations and Acronyms

For the purposes of JDS-G223, the abbreviations and acronyms in Table 1 apply.

Table 1 Abbreviations and Acronyms

Abbreviation or Acronym	Definition
AAU	Average Annual Usage
AIAG	Automotive Industry Action Group
APN	Action Priority Number
AUP	Annual Usage Percentile
ConOps	Concepts of Operation
CMMI	Capability Maturity Model Integration
CuSum	Cumulative Sum Control Chart
DFMEA	Design Failure Modes and Effects Analysis
DSM	Design Structure Matrix
FGR	Functional Geometry Review
FIFO	First In First Out
ISIR	Initial Sample Inspection Report
LSL	Lower Specification Limit
MSA	Measurement System Analysis
NCCA	Non-Conformance Corrective Action
OEM	Original Equipment Manufacturer
OFRA	Order Fulfillment Risk Assessment
OpsCon	Operation Concepts
PEA	Product Engineering Assessment
PLQP	Part Level Quality Plan
PVA	Process Verification Audits
SCR	Supplier Change Request
SPA	Special Process Audits
SPICE	Software Process Improvement and Capability Determination
USL	Upper Specification Limit

4 Context of the Organization

4.1 Understanding the Organization and Context of the Quality Management System

ISO 9001:2015 clause 4.1 requirements shall apply.

4.2 Understanding the Needs and Expectations of Interested Parties

4.2.1 ISO 9001:2015 clause 4.2 requirements shall apply.

4.2.2 Suppliers to John Deere shall conduct business with a high degree of integrity, and in a socially and environmentally responsible manner in accordance with the John Deere Supplier Code of Conduct.

4.2.3 ISO 9001:2015 represents the minimum external standard requirement for John Deere. All suppliers shall meet the requirements of JDS-G223 for John Deere. Suppliers in the John Deere supply chain should become compliant to the IATF 16949 standard.

4.2.4 John Deere may conduct a quality system assessment at the supplier's facility. When conducting this assessment, John Deere shall have access to the supplier's personnel, documentation, gaging, and test facilities. At the close of the assessment, John Deere shall share findings in a debriefing meeting and, at a later date, shall issue a report to the supplier summarizing the results of the assessment.

4.2.5 John Deere may conduct SPA of supplier's special processes in the manufacturing of John Deere parts. See clause 8.5.1.2.

4.2.6 When a first-tier supplier outsources, either temporarily or permanently, the first-tier supplier shall be responsible for assessing and approving the second tier suppliers. See clause 8.4.2.3.

4.2.7 John Deere may conduct a PEA for components with quality plan Levels ≥ 3 when the supplier has component or subsystem design control or when required to support the component reliability assessment process.

4.2.8 John Deere may conduct PVA on selected components. This on-site supplier quality audit is intended for parts with a high level of criticality to determine the effectiveness and conformance of process controls. This audit may also be performed on similar parts when the work has not yet been sourced, or during preparation for full production.

4.2.9 John Deere may conduct an OFRA high-level assessment to assess the supplier's order fulfillment (delivery) readiness, identify risks, and drive improvements.

4.2.10 Any items requiring corrective action shall be clearly noted, and the supplier shall submit a corrective action plan to address these issues within the agreed upon target date.

4.2.11 When the supplier does not meet the minimum level of performance of these requirements as measured by the JDS-G223 supplier quality system audit, such failure shall impact, and can potentially restrict future business until the identified major non-conformances are corrected, verified, and closed.

4.3 Determining the Scope of the Quality Management System

4.3.1 ISO 9001:2015 clause 4.3 requirements shall apply.

4.3.2 Suppliers shall perform a self-evaluation to determine where the supplier's and the supplier's supply chain quality systems align with JDS-G223. Acceptance of a John Deere purchase order constitutes acceptance by the supplier of the requirements of JDS-G223.

4.3.3 The quality management system documentation shall include the following:

- Adherence to the John Deere Supplier Code of Conduct.
- Documented statements of a quality policy and quality objectives.
- A quality manual.
- Managing the quality system's processes in accordance with the requirements of JDS-G223.
- All records required by JDS-G223.
- Documents needed by the supplier to ensure the effective planning, operation, and control of the processes.
- Communicating to John Deere, within 30 days, any changes to third party certification (quality, regulatory, health and safety, and environmental).

4.3.4 Suppliers shall use the most current standards, understand relevant standards, and review any changes in those standards. Suppliers can review changes to John Deere standards by selecting "What's New" on JDSN.

Note 15 Many of the activities referenced in this document are further explained in the AIAG manuals, such as MSA and Failure Mode and Effects Analysis (FMEA). Suppliers should obtain copies of the AIAG manuals.

4.4 Quality Management System and Processes

4.4.1 ISO 9001:2015 clause 4.4.1 requirements shall apply.

4.4.2 ISO 9001:2015 clause 4.4.2 requirements shall apply.

4.4.3 Processes needed for the quality management system should include processes for management activities, provision of resources, product realization, and measurement. See clause 8.5.6.1.1 for John Deere notification requirements.

4.4.4 When the supplier chooses to outsource any product or process which affects product conformity with requirements, the supplier shall ensure control over such products or processes, including control of raw material and service parts. Control of such outsourced products and processes shall be identified within the quality management system.

4.4.5 When John Deere is using a supplier-controlled drawing with the John Deere title block (John Deere confidential) and the drawing is changed, the supplier shall notify John Deere by using the SCR system on JDSN (see clause 8.5.6.1.1) and receive approval prior to implementing change.

5 Leadership

5.1 Leadership Commitment

5.1.1 General

ISO 9001:2015 clause 5.1.1 requirements shall apply.

5.1.2 Customer Focus

5.1.2.1 ISO 9001:2015 clause 5.1.2 requirements shall apply.

5.1.2.2 The supplier shall define and implement corporate responsibility policies which at a minimum align with the John Deere Supplier Code of Conduct.

5.1.2.3 Top management shall ensure that John Deere's needs and expectations are determined, converted into requirements, and fulfilled with the aim of achieving John Deere satisfaction.

5.1.2.4 John Deere satisfaction includes but is not limited to the following:

- Conformance to design and performance specifications.
- Quality.
- Reliability.
- Delivery.
- Cost management.
- Wavelength and technical support (Achieving Excellence Suppliers).

5.2 Policy

5.2.1 Establishing the Quality Policy

ISO 9001:2015 clause 5.2.1 requirements shall apply.

5.2.2 Communicating the Quality Policy

ISO 9001:2015 clause 5.2.2 requirements shall apply.

5.3 Organizational Roles, Responsibilities, and Authorities

5.3.1 ISO 9001:2015 clause 5.3 requirements shall apply.

5.3.2 Top management shall assign, and document the assignment of, personnel with the responsibility and authority to ensure that John Deere requirements are met. Requirements shall include but are not limited to the following:

- Quality planning.
- Quality control.
- Quality improvement.
- Manufacturing and tooling improvements.
- Quality information systems.
- Quality training.
- Quality budgeting.

6 Planning

6.1 Actions to Address Risks and Opportunities

6.1.1 ISO 9001:2015 clause 6.1.1 requirements shall apply.

6.1.2 ISO 9001:2015 clause 6.1.2 requirements shall apply.

6.1.3 The supplier shall identify contingency plans.

6.1.3.1 Identify and evaluate internal and external risks to manufacturing processes and infrastructure essential to maintain production output and to ensure John Deere requirements are met.

6.1.3.2 Prepare contingency plans in the event of any of the following: key equipment failures; interruption from externally provided products, processes, and services; natural disasters; fire; utility interruptions; governmental or health department restrictions; cyber-attacks on information technology systems; labor shortages; counterfeit parts introduced into the supply chain; or infrastructure disruptions.

6.1.3.3 A notification process to John Deere shall be documented including the extent and duration of any situation impacting operations.

6.1.3.4 Periodic testing (simulations, as appropriate) of contingency plans for effectiveness. The testing of cybersecurity shall be appropriate to the risk of potential John Deere disruption.

6.1.3.5 Contingency plans shall be reviewed minimum yearly and updated as required.

6.1.3.6 Traceability and authorization of any changes to contingency plans shall be documented and available for review by John Deere.

6.2 Quality Objectives and Planning to Achieve Them

6.2.1 ISO 9001:2015 clause 6.2.1 requirements shall apply.

6.2.2 ISO 9001:2015 clause 6.2.2 requirements shall apply.

6.3 Planning of Changes

ISO 9001:2015 clause 6.3 requirements shall apply.

7 Support

7.1 Resources

7.1.1 General

ISO 9001:2015 clause 7.1.1 requirements shall apply.

7.1.2 People

ISO 9001:2015 clause 7.1.2 requirements shall apply.

7.1.3 Infrastructure

ISO 9001:2015 clause 7.1.3 requirements shall apply.

7.1.4 Environment for the Operation of Process

ISO 9001:2015 clause 7.1.4 requirements shall apply.

7.1.5 Monitoring and Measuring Resources

7.1.5.1 General

ISO 9001:2015 clause 7.1.5.1 requirements shall apply.

7.1.5.2 Measurement Traceability

7.1.5.2.1 ISO 9001:2015 clause 7.1.5.2 requirements shall apply.

7.1.5.2.2 The measuring equipment selected shall have a discrimination of less than one-tenth of the feature's characteristic's total tolerance range being measured. When the discrimination is not possible, the supplier shall gain agreement with the John Deere quality engineer on the measuring equipment selected. See JCGM 100:2008 or ISO 14253 series for additional information regarding uncertainty in measurement.

7.1.5.2.3 Gages shall be reviewed for potential revisions following engineering changes.

7.1.5.2.4 Whenever a gage is found out of calibration and it has been used to verify parts for John Deere, the supplier shall notify John Deere of the suspect parts.

7.1.5.2.5 Suspect part notification shall include statements of conformity to specification after calibration and verification.

7.1.5.2.6 The supplier shall establish and maintain documented procedures for the calibration, control, and maintenance of measuring, inspection, and test equipment used to ensure that products and processes conform to applicable requirements. The documented procedures shall include processes for out-of-calibration equipment and notification to John Deere.

7.1.5.2.7 Records of calibration activities shall be maintained. See clause 7.5.3.3.

7.1.5.2.8 When using an internal laboratory for calibration or test, the laboratory shall have a defined scope, including:

- Laboratory technical procedures.
- Competency of personnel.
- Requirements for testing of product.
- Traceability to national or international standards, or if not available, methodology to verify measurement capability.

Note 16 Third-party accreditation (for example, ISO/IEC 17025) may be used to demonstrate conformity.

7.1.5.2.9 When using an external laboratory for calibration, the laboratory shall be accredited by a national or international accreditation body to an international standard (for example, ISO/IEC 17025).

7.1.5.2.10 For certain applications John Deere can provide gages, test fixtures, and test machines to the supplier. Such equipment remains the property of John Deere, which shall provide a gage drawing with the gage for the supplier's records.

7.1.5.2.11 The supplier shall review John Deere gages to ensure proper function and application, as well as calibrate, repair, and replace non-conforming gages.

7.1.5.3 Gage Repeatability and Reproducibility

7.1.5.3.1 Gage R&R shall be done for variable and attribute gages used for all new or modified special characteristics on the model, drawing, or a combination of both, and any additional characteristics identified during the DPAR. See clause 8.3.6 for more information regarding special characteristics.

7.1.5.3.2 John Deere approval shall be required for the use of attribute gaging on special characteristics. When an attribute gage study is required, refer to Fleiss, Levin, & Paik (2003), and Kazmierski (1995).

7.1.5.3.3 The method for performing the gage R&R study shall be either the range method or the ANOVA method as defined in the AIAG MSA manual.

7.1.5.3.4 The personnel who use the measuring instrument in production shall perform the measurement in the gage R&R study.

7.1.5.3.5 Gage R&R studies shall be performed whenever new production personnel begin using the measuring instrument.

7.1.5.3.6 Gage R&R studies apply to variable and attribute gages. Attribute gage R&R studies (such as ring or plug gages) are not required unless requested by John Deere.

7.1.5.3.7 Attribute gages shall be checked and certified at an agreed upon frequency for accuracy.

Note 17 Typically, this frequency is annually.

7.1.5.3.8 For non-dedicated measuring instruments such as coordinate measuring machines (CMM), a Gage R&R shall be conducted utilizing part specific programs on all special characteristics, and other characteristics identified by John Deere.

7.1.5.3.9 Gage R&R studies on families of measuring instruments shall be agreed to by John Deere prior to completion of the DPAR.

7.1.5.3.10 Some types of measuring instruments, such as flow meters and hardness testers do not lend themselves to the Gage R&R process. These types of measuring instruments shall be identified in the calibration program, and shall be verified at a specified frequency using industry or OEM standards.

7.1.5.3.11 When the total variation of the repeatability and reproducibility of the measurement system (measuring instrument and operator) is < 30 % of the total tolerance range, the measurement system is acceptable for use. When the supplier uses a measurement system with a total variation > 30 %, John Deere shall be contacted for approval.

7.1.5.3.12 John Deere may require less variation for certain critical applications. A John Deere quality engineer shall communicate requirements as needed.

7.1.5.3.13 A measurement system shall be proven repeatable and reproducible before it is used in a capability study or is used to accept or reject parts.

7.1.5.3.14 When the measurement system fails, the supplier shall take corrective action to make the measuring instrument results repeatable and reproducible.

7.1.6 Supplier Knowledge

ISO 9001:2015 clause 7.1.6 requirements shall apply.

7.2 Competence

7.2.1 ISO 9001:2015 clause 7.2 requirements shall apply.

7.2.2 John Deere training for JDS-G223, John Deere Standards, EPDP, Supply Chain Integration, and other quality tools are available on JDSN.

7.3 Awareness

7.3.1 ISO 9001:2015 clause 7.3 requirements shall apply.

7.3.2 The training shall provide employees with an awareness of the relevance and importance of employee's activities, and how employees contribute to the achievement of quality objectives and recognition in the business plan.

7.4 Communication

ISO 9001:2015 clause 7.4 requirements shall apply.

7.5 Documented Information

7.5.1 General

7.5.1.1 ISO 9001:2015 clause 7.5.1 requirements shall apply.

7.5.1.2 The supplier's quality management system shall be documented, and shall include a quality manual, which can be a series of documents (electronic or hard copy).

7.5.1.3 The format and structure of the quality manual is at the discretion of the supplier and depends on the supplier's size, culture, and complexity. When a series of documents is used, a list of the documents which comprise the quality manual for the supplier shall be retained.

7.5.1.4 At a minimum, the quality manual shall include the following:

- The scope of the quality management system, including details of and justification for any exclusions.
- Documented processes established for the quality management system, or reference to them.
- The supplier's processes and sequence and interactions (input and outputs), including type and extent of control of any outsourced processes.
- A document (for example, matrix) indicating where within the supplier's quality management system John Deere-specific requirements are addressed.

7.5.2 Creating and Updating

ISO 9001:2015 clause 7.5.2 requirements shall apply.

7.5.3 Control of Documented Information

7.5.3.1 ISO 9001:2015 clause 7.5.3.1 requirements shall apply.

7.5.3.2 ISO 9001:2015 clause 7.5.3.2 requirements shall apply.

7.5.3.3 Unless otherwise specified in the supplier's quality manual and agreed to by John Deere, all quality records shall be kept for the duration of production and service requirements or a minimum of three years, whichever is longest.

8 Operation

8.1 Operational Planning and Control

ISO 9001:2015 clause 8.1 requirements shall apply.

8.1.1 General

8.1.1.1 The supplier shall have a documented process for planning of product realization to meet requirements of the John Deere EPDP, with evidence of product conformance being driven by the PDP and Initial Production (pre-launch), and OFP (production) flowcharts. See clause 9.

8.1.1.2 An effective and structured product realization planning process shall result in the determination of the following:

- The requirements for products and services including quality goals with defined criteria for acceptance.
- Identify the resources needed to create compliant products and services.
- Defined process criteria and control of the processes.
- Controlled and monitored outsourced processes and evaluations.
- Monitored changes of any type.
- Assessed consequences of unplanned changes, including the necessary corrective actions.

8.1.2 Acceptance Criteria

Where required, acceptance criteria of the product shall be approved by John Deere.

8.1.3 Confidentiality

The supplier shall ensure the confidentiality of John Deere contracted products, projects under development, and related product information. The control of confidential information shall include the supply chain and communication of John Deere information.

8.2 Requirements for Products and Services

8.2.1 Communication to John Deere

ISO 9001:2015 clause 8.2.1 requirements shall apply.

8.2.2 Determining Requirements for Products and Services

8.2.2.1 ISO 9001:2015 clause 8.2.2 requirements shall apply.

8.2.2.2 When determining the requirements for the products and services to be offered to John Deere, the supplier shall ensure that the requirements for the products and services are defined; including those considered necessary by the supplier.

8.2.2.3 The supplier shall meet any applicable statutory and regulatory requirements.

8.2.2.4 The supplier shall comply with the John Deere Restricted Materials List (for example, asbestos or lead in paint), and applicable laws which indicate that supplied products do not contain substances in excess of the amounts set forth on John Deere's Restricted Materials List, or any substances restricted by applicable laws.

8.2.2.5 When there is a conflict between the John Deere Restricted Materials List and applicable laws, the more stringent requirements shall be met.

Note 18 The Restricted Materials list is located on JDSN.

8.2.3 Review of Requirements for Products and Services

8.2.3.1 ISO 9001:2015 clause 8.2.3.1 requirements shall apply.

8.2.3.2 ISO 9001:2015 clause 8.2.3.2 requirements shall apply.

8.2.3.3 The supplier shall have a documented process to support John Deere designated special characteristics.

8.2.4 Changes to Requirements for Products and Services

ISO 9001:9001:2015 clause 8.2.4 requirements shall apply.

8.3 Design and Development of Products and Services

8.3.1 General

ISO 9001:2015 clause 8.3.1 requirements shall apply.

8.3.2 Design and Development Planning

ISO 9001:2015 clause 8.3.2 requirements shall apply.

8.3.2.1 Advanced Product Quality Planning

8.3.2.1.1 Specific quality planning activities are required for every new or revised part, and for every new or revised process. At John Deere, the PLQP activities help ensure that new products or processes, and changes to existing products or processes, fulfill the intended purposes.

Note 19 PLQP provides a consistent, structured, and preventive process for managing risks associated with new or revised parts and assemblies, and with changes to suppliers and processes**.**

8.3.2.1.2 John Deere utilizes a QPL determined at the supplied component level. The supplier's quality plan should be based on ISO 10005:2018 in addition to the John Deere defined QPL planning.

8.3.2.1.3 Activities that may be required during quality planning process are design reviews, FGR, and DPAR.

8.3.2.1.4 Design reviews, FGR, and DPAR are led by John Deere team members from areas such as product engineering, reliability, engineering, PV&V, quality, supply management, manufacturing engineering, and materials engineering and supported by a cross-functional supplier team.

8.3.2.1.5 Documentation of the design review, FGR, and DPAR inputs, events and outputs shall be maintained by John Deere. Supporting design review, FGR, and DPAR information is available on JDSN.

8.3.2.1.6 Suppliers shall provide technical leadership to achieve the desired following outputs:

- Design Review
  - Identify potential design problems.
  - Initiates corrective action as early in the project as possible. Ensures that the final product meets John Deere's and business needs.
- FGR
  - Identify functional datums on unit parts, sub-assemblies, and assemblies.
  - Confirm or generate functional tolerances.
  - Identify potential manufacturing or inspection problems.
  - Ensure that models/drawings and specifications satisfy functional requirements.
  - Discuss identified special characteristics.
- DPAR
  - Confirm all expectations of the product or service prior to a physical build.
  - Confirm PPAP requirements.
  - Confirm packaging requirements.
  - Review and approval of tooling release.
  - Review of target dates.

Note 20 Example of the items covered during this meeting are shown in the DPAR checklist on JDSN.

8.3.2.1.7 When identified, special characteristics shall be recorded during the early stages of design and shall be communicated to suppliers. Supplier defined special characteristics shall be communicated to John Deere. See clause 8.3.6.

8.3.2.1.8 Quality planning activities shall be completed for first physical builds, and shall be updated for subsequent physical builds.

8.3.2.1.9 Unless otherwise approved by John Deere, all parts shall be production intent for physical builds, and should be produced using production tooling in a production process.

8.3.2.1.10 Quality planning activities shall be repeated for parts that are provided utilizing non-production tooling or processes once production tooling and processes are available.

8.3.2.1.11 When tooling or processes utilized to provide production parts differ from those used in prior non-production runs, evidence of conformance to the specification and risk mitigation shall be provided.

8.3.2.1.12 After successful completion of the final phase of EPDP, the OFP flowchart shall be followed. See clause 9 and Figure 2.

8.3.2.2 Failure Modes and Effects Analysis

8.3.2.2.1 FMEA and supporting documentation shall be maintained through the life of the product and process.

8.3.2.2.2 FMEA shall be performed by a multi-disciplined group.

8.3.2.2.3 FMEA shall be conducted in the early stages of design (SFMEA/DFMEA), and shall be applied to all manufacturing process (PFMEA) utilized in the manufacturing of the products purchased by John Deere.

8.3.2.2.4 The supplier shall define thresholds that require action based on severity, occurrence, detection, RPN, and APN as applicable. The use of any single threshold alone is not recommended for determining priority.

8.3.2.2.5 FMEA shall be reviewed during design or manufacturing process updates, and shall be considered a living document.

8.3.2.2.6 FMEA shall be updated as a result of learning new information regarding failure modes.

8.3.2.2.7 FMEA shall be updated as a result of the corrective action process.

Note 21 For additional information, see AIAG Failure Mode and Effects Analysis Manual and AIAG &VDA Failure Modes and Effects Analysis handbook latest editions.

8.3.2.3 Development of Software and Products with Software

8.3.2.3.1 Suppliers shall use a process for quality assurance (quality planning) for their developed software, and supplier shall include software development in their internal audit program.

8.3.2.3.2 To ensure quality, it is proposed to use process assessments like SPICE (Software Process Improvement and Capability Determination) or CMMI (Capability Maturity Model Integration) for self-assessment.

8.3.2.3.3 The development process shall cover the following:

- Requirements.
- Design.
- PV&V.
- Implementation.
- Test.
- Risk management.
- Traceability and revision control.
- Change management.

8.3.2.3.4 Supplier software development processes shall align with John Deere requirements.

8.3.3 Design and Development Inputs

8.3.3.1 ISO 9001:2015 clause 8.3.3 requirements shall apply.

8.3.3.2 System/component specifications shall be developed, reviewed, and approved with the supplier and John Deere.

8.3.3.3 Any changes after initial approval shall be submitted by the supplier for approval from John Deere.

8.3.3.4 A system/component specification shall include, but is not limited to:

- System engineering guidelines. See Table 2.
- Reliability goal breakdown. See Table 3.
- Mounting location information. See Table 4.
- Usage environment conditions. See Table 5.

Table 2 System Engineering Guidelines

Stage	Tool
Identify/Research System of Interest	• Mission statement • List of stakeholders and their needs • Context diagram • System boundary diagram
Capture Operational Behavior	• ConOps • OpsCon, use cases, sequence diagrams
System Requirements	• Stakeholder needs • Functional architecture • Functional DSM • System requirements • Validate requirements with stakeholders
Develop/Evaluate Architectures	• Technology assessment • Trade space analysis and morphological matrix • Structural architecture • Structure DSM • Interface definition

Table 3 Reliability Goal Breakdown

John Deere Usage Information	
Average User Information	• AAU (hours or cycles) • Percentile John Deere used for AAU
Top User Information	• AUP (hours or cycles) • Percentile John Deere used for AUP
Durability Period	• Design for Life (hours)
Warranty Period	• Warranty Period (years or hours)
Durability Period	• Design for Life (hours)
Preferred Confidence Level for Durability/Reliability Testing	• Confidence Level (%)
Component Goal Breakdown	
Component Failure Mechanism	• Define as either wear-out or overstress mechanism. • Define the reliability percent for the failure mechanism at a given point of time (for example, B10 = 5 000 hours). • Define a specified design safe coefficient.
High Level Duty Cycle Operation	
Expected Usage	• List of applications. • Number of actuations per period of time. • Percent of time spent on each of the different operations.
Component Allocation	
Warranty	• Warranty Period (hours and cycles). • Reliability required at the end of the warranty period (%).
Durability	• Design life of the product (hours or cycles). • Reliability required at the end of the design life of the product.

Table 4 Component Mounting Location

Drawing/Chart	Reason
Component interface diagram (I/O)	An input/output (I/O) diagram illustrates the connection points which a component or system, may have with other systems. Information from this chart may be used to understand key data to properly set up a test.
Identification of critical components/items in close proximity to the component (for example, engine and exhaust)	Clear identification of potential stresses which can act as catalytic agents to induce a particular failure mode (for example, induced vibration from a nearby component, susceptibility due to an electric line, or heat conduction from a hydraulic line).
Drawings of mounting location (with dimensions)	Mounting location drawings are required to accurately replicate component mounting conditions on test fixtures.
Rigidity and cushioning conditions	Identifying any rigidity or cushioning conditions used to support the component in the vehicle. Most commonly used in vibration testing to determine when the design is adequate to avoid some resonant frequencies that can be harmful to the component.

Table 5 Usage Environmental Conditions

Condition	Possible Test Conditions
Manufacturing	• Are there any environmental factors which can affect performance (for example, drops or electrostatic discharges)? • Are there any assembly line risks associated with the product's manufacturing process (for example, improper torque specification)?
Transportation to Dealership/End Customer	• How is the product packaged (for example, crate or box)? • What is the mode of transportation (for example, air, truck, or ship)? • Are there any risks associated with the transportation process (for example, altitude, vibration, or humidity)?
Storage Conditions	• What are the expected warehouse environmental conditions (for example, humidity or temperature vapors)
Startup Conditions	• Are there any special conditions worth noting at startup (for example, cold starts)?
Transportation to Field	• Are there any special conditions which the product experiences while transporting to the field (for example, highway conditions or trailer conditions)?
Operating Conditions	• How is the product used in the field? • What percent of the time is the product doing each operation? • What are the environmental conditions in the field (for example, temperature ranges, humidity ranges, or vibration)?

Table 5 Usage Environmental Conditions

Condition	Possible Test Conditions
	• Are there any chemicals or liquids present in the operation?
Special John Deere Conditions	• Are there special uses for the equipment? • What are those conditions? • Where are those conditions more prominent? • Are there any special requirements for the countries where the product shall be sold (for example, electromagnetic interference)? • Do any of these conditions happen while the product is turned off?

8.3.4 Product Design Input

8.3.4.1 The supplier shall identify, document, and review the product design input requirements.

8.3.4.2 Design input requirements should include the following:

- John Deere requirements (contract review) such as:
  - Special characteristics.
  - Identification.
  - Traceability.
  - Packaging.
- Process to deploy information gained from previous design projects.
- Systems analysis.
- Component obsolescence risk.
- Competitor analysis.
- Supplier feedback.
- Internal input.
- Field data.
- Other relevant sources for current and future projects of similar nature.
- Targets for conformity to the following:
  - Product requirements.
  - Life.
  - Reliability.
  - Durability.
  - Maintainability.
  - Timing.
  - Cost.

8.3.5 Manufacturing Processes Design Input

8.3.5.1 The supplier shall identify, document, and review the manufacturing process design input requirements.

8.3.5.2 The manufacturing process design inputs should include the following:

- Product design output data.
- Targets for:
  - Productivity.
  - Process.
  - Cost.
- John Deere requirements shall apply.
- Experience from previous developments on similar components.
- Design for manufacturability.

8.3.6 Special Characteristics

8.3.6.1 Special characteristics can exist for both products and processes. A structured process shall be used to identify special characteristics and corresponding controls. See Table 6 for minimum process capability on critical and key characteristics.

Table 6 Special Characteristic Control Plan Guide

Name of Symbol	Critical Characteristic <CC>	Key Characteristics <KC>
Type	**Safety or Compliance**	**Warranty**
Description	**Critical Characteristics require extra control to prevent safety or compliance-related non-conformances.**	**Key Characteristics require extra control to prevent significant warranty, machine downtime, or customer dissatisfaction.**
FMEA Ranking (guideline)	Severity = 9, 10	Severity = 7,8, or Occurrence = 7-10
Minimum Initial Control Requirements	Gage R&R less than 20 %	Gage R&R less than 30 %
	Capability Study	Capability Study
	1.67 Ppk minimum[1,2]	1.33 Ppk minimum[1,2]
Minimum Ongoing Control Requirements	1.67 Cpk or Cpm with appropriate sampling plan[3]	Inspection with appropriate sampling plan required Variable data preferred and requires 1.33 Cpk or Cpm[3]
	Ongoing process monitoring with variable data	Ongoing process monitoring (Attribute gaging minimum for example, go/no-go gages)
Minimum Ongoing Traceability and Retention[4]	Serial Number required[5]	Evidence of Inspection required Serial number or lot number preferred

[1] **Note:** If a normal distribution is not achieved, identify and communicate alternate methods used.

[2] **Note:** 30 piece sample minimum required. If 30 pieces is not achieved, 100 % ongoing inspection shall be required until process capability is achieved and sustained.

[3] **Note:** If sampling plan does not allow Cpk or Cpm t be properly calculated, Ppk or Ppm may be used, and should be communicated accordingly.

[4] **Note:** See clause 7.5.3.3 for supplier retention guidelines.

[5] **Note:** If serialization is not achieved, identify and communicate alternate method.

8.3.6.2 Product special characteristics shall be documented on the control plan.

8.3.6.3 Product special characteristics shall also be documented on either the drawing, the model, product specifications, assembly specifications, or a combination of the four as required by John Deere. Any deviations to special characteristics shall require John Deere leadership approval.

8.3.6.4 Product critical characteristics shall be identified by the symbol <CC>, and product key characteristics shall be identified by the symbol <KC>. Product key characteristics on older drawings can be depicted through the use of a special symbol such as ◑ or ◆.

8.3.6.5 Process special characteristics can exist without corresponding product special characteristics. Process special characteristics are not designated by a special symbol.

8.3.6.6 Process special characteristics shall be documented on the control plan.

8.3.7 Design and Development Controls

See ISO 9001:2015 clause 8.3.4 requirements.

8.3.7.1 Design and Development Review

8.3.7.1.1 At suitable stages, systematic reviews of design and development shall be performed in accordance with planned arrangement to evaluate the ability of the results of design and development to meet requirements, to identify problems, and to propose necessary actions.

8.3.7.1.2 System/design reviews shall be used to identify how the design works and how the various subsystems work together. Tools, such as FMEA, shall be used to identify problems. These tools are repeated as required as the design evolves to completion.

8.3.7.1.3 System/design reviews can be conducted at various stages of the design and development process to accomplish the outputs listed in clause 8.3.8.2, and to periodically review the ability of the supply chain to fulfill requirements.

Note 22 Design reviews are typically conducted with John Deere and supplier team members (design competency experts) from areas such as product engineering, product verification and validation, reliability engineering, marketing, supply management, quality engineering, manufacturing engineering, and materials engineering. Design reviews should take place earlier than the DPAR in the EPDP.

8.3.7.1.4 The review shall be documented, and corrective action plans shall be developed and validated for any problems identified.

8.3.7.1.5 Significant key outputs of the system/design review process shall include but are not limited to the following:

- Identification of the design and development processes.
- Identification of the verification and validation activities appropriate for each design and development stage.
- Identification of responsibilities and authorities for each of the design and development process.
- Determination of the requirements for, and methods of communication at each stage in the design and development process.
- Specification of functional and performance requirements of the product or service.
- Identification of criteria for acceptability, including special characteristics plus other characteristics that are identified by John Deere.
- Determination of applicable regulatory and legal requirements.
- Identification of applicable information derived from previous similar designs.
- Identification of product or service acceptance criteria.
- Definition of the characteristics of the product which are essential for safe and proper use.
- Specification of special packaging requirements for proper delivery to John Deere.
- Determination of risk when specifications are not met.
- Establishment of risk mitigation strategy for non-conformances to component specification.

8.3.7.1.6 Records of the reviews and any necessary actions shall be maintained. See clause 7.5.3.3

8.3.7.1.7 When design control of the product resides with the supplier, the supplier shall conduct design reviews. John Deere and representation from second tier suppliers should be included as appropriate.

8.3.7.2 Design and Development Verification

8.3.7.2.1 Verification shall be performed in accordance with planned arrangements to ensure that the design and development outputs have met the design and development input requirements.

8.3.7.2.2 Records of the results of the verification and any necessary actions shall be maintained. See clause 7.5.3.3.

8.3.7.3 Design and Development Validation

8.3.7.3.1 Design verification and validation plans shall be developed to ensure that the product design meets the objectives for performance and reliability that have been established, and shall meet or exceed the defined John Deere specifications.

8.3.7.3.2 John Deere and the supplier shall jointly develop the PV&V plan.

8.3.7.3.3 The PV&V plan shall consider component functionality, reliability, durability, software function, environmental conditions, anticipated applications, existing and potential failure modes and mechanisms, interfaces with other system components and controls, John Deere expectations, and key performance characteristics.

8.3.7.3.4 The PV&V plan should have clear linkage between the component requirements and the tests.

8.3.7.3.5 The PV&V gaps shall be identified and mitigated using processes and tools including the following:

- Design analysis.
- Key technology analysis.
- FMEA.
- Design reviews.
- Lab and field testing.

8.3.7.3.6 Component reliability shall be demonstrated for high risk failure modes and mechanisms through the John Deere component reliability assessment process, which shall include both overstress and wear-out failure mechanisms.

8.3.7.3.7 Product verification and validation plans and results shall be documented using a template provided by John Deere. The completed template shall be returned to John Deere so the data can be imported into the John Deere PV&V System for documentation and tracking purposes.

8.3.7.3.8 When requested, the supplier shall assist in conducting the PV&V activities either at John Deere or at the supplier's facility. The supplier shall provide information about standardized tests which are routinely conducted for the supplied product.

8.3.7.3.9 John Deere may conduct a PEA for components with QPL 3 or QPL 4 when the supplier has component or subsystem design control, and when required to support the component reliability assessment process.

8.3.7.3.10 John Deere may provide suppliers a component reliability goal. In this case, the supplier shall provide statistical evidence that the component goal is met.

8.3.7.3.11 The component reliability assessment process shall be used when directed by John Deere.

8.3.7.3.12 When a component reliability assessment process component is being supplied or when requested, the supplier shall complete and submit the component performance and reliability assurance form to John Deere.

8.3.7.3.13 The supplier and John Deere shall sign the component performance and reliability assurance form when the component meets or exceeds the specifications, including reliability, and shall be signed before any components are provided for a John Deere physical build.

8.3.7.3.14 Records of the results of validation and any necessary actions shall be maintained. See clause 7.5.3.3.

8.3.7.4 John Deere Part Approval Process

8.3.7.4.1 The PPAP submission shall meet the requirements documented in JDS-G223X3. PPAP requirements shall be clearly understood as an output of the DPAR. Additional requirements should be documented as an output of the DPAR.

8.3.7.4.2 John Deere reserves the right to modify submission requirements based on supplier performance.

8.3.7.4.3 The John Deere quality representative reviews the submitted PPAP documents and shall approve or reject the verification warrant.

8.3.7.4.4 Verification warrant approval shall be required prior to shipping production parts for all physical builds.

8.3.7.4.5 Experimental part builds shall follow the MaSA process, and suppliers shall follow the inspection levels as defined by the quality engineer.

Note 23 Refer to JDS-G223X3 for additional details on MaSA and PPAP requirements.

8.3.8 Design and Development Outputs

ISO 9001:2015 clause 8.3.5 requirements shall apply.

8.3.8.1 Product Design Output

8.3.8.1.1 The system/product design output shall be expressed in terms which can be verified and validated against system/product design inputs.

8.3.8.1.2 Where applicable, the system/product design outputs shall include the following:

- System FMEA.
- Design FMEA.
- Reliability results.
- Product special characteristics and specifications.
- Product error-proofing (as appropriate).
- System/Product definition.
    - Models.
    - Drawings.
    - Mathematical based data.
- System/Product design review results.
- Diagnostic guidelines.

8.3.8.2 Manufacturing Process Design Output

8.3.8.2.1 The manufacturing process design output shall be expressed in terms which can be verified against manufacturing process design input requirements and validated against manufacturing process design outputs.

8.3.8.2.2 Where applicable, the manufacturing process design outputs shall include the following:

- Specifications and drawings.
- Manufacturing process flow chart/layout.
- Process FMEA.
- Process Special Characteristics.
- Control plan.
- Work instructions.
- Process approval acceptance criteria.
- Data
    - Quality.
    - Reliability.
    - Maintainability.
    - Measurability.
- Results of error-proofing activities.
- Methods for the rapid detection and feedback of product and manufacturing process non-conformities.

8.3.9 Design and Development Changes

8.3.9.1 ISO 9001:2015 clause 8.3.6 requirements shall apply.

8.3.9.2 Regardless of design ownership, changes to design and development shall be approved by John Deere design engineering prior to implementation.

8.3.9.3 The results of the review of changes and any subsequent follow-up activities shall be maintained.

8.3.9.4 For products with software, the revision or version level of the software and hardware shall be documented as part of the change record.

8.4 Control of Externally Provided Processes, Products, and Services

8.4.1 General

8.4.1.1 ISO 9001:2015 clause 8.4.1 requirements shall apply.

8.4.1.2 As a primary supplier to John Deere, the supplier is responsible for the quality of the products and services provided by supplier's supply chain.

8.4.1.3 The requirements of the JDS-G223 should be extended to the supplier's supply chain.

8.4.1.4 Any risks in the supply chain shall be identified, and shall be communicated to John Deere in a timely manner. These risks shall include counterfeit parts.

8.4.1.5 Supplier Selection Process

8.4.1.5.1 The supplier shall have a documented system to properly select suppliers with the capability to meet JDS-G223 and other applicable John Deere Standards.

8.4.1.5.2 The initial supplier selection process for providers of products or services for John Deere shall include a documented assessment process to determine the supply chain's capability to meet the requirements of JDS-G223.

8.4.1.5.3 Selected suppliers or providers of products or services for John Deere should have a quality management system implemented.

8.4.2 Type and Extent of Control

ISO 9001:2015 clause 8.4.2 requirements shall apply.

8.4.2.1 Regulatory Conformity

8.4.2.1.1 The supplier shall own the patent or copyright which permits to lawfully manufacture the product, or utilize the manufacturing process, that John Deere desires to purchase.

8.4.2.1.2 The supplier shall be properly licensed by the holder of the patent or copyright to produce or utilize the manufacturing process.

8.4.2.1.3 The supplier shall have documentation to substantiate either ownership of the requisite intellectual property rights, or that the supplier is properly licensed to use the requisite intellectual property rights.

8.4.2.1.4 When intellectual property rights are effective and legally enforceable in the country where the supplier produces the product or utilizes the manufacturing process, the supplier shall have documentation to substantiate that the supplier's intellectual property rights are effective in the country where it produces the product or utilizes the manufacturing process.

8.4.2.1.5 The duration of the requisite intellectual property shall be sufficient to cover the term of the proposed supply agreement with John Deere.

8.4.2.1.6 The supplier shall identify any third-party intellectual property rights which can interfere with the proposed supply agreement.

8.4.2.2 Compliance

8.4.2.2.1 The supplier shall comply with requirements called out in the John Deere Supplier Code of Conduct. See JDSN for latest version.

8.4.2.2.2 The John Deere Supplier Code of Conduct and any other applicable legal requirements shall be communicated through the supply chain by each supplier.

8.4.2.3 Supplier Monitoring and Audits

8.4.2.3.1 The supplier shall monitor second tier supply chain's performance on an ongoing basis, including the following:

- Delivered product conformity to specifications.
- Customer disruptions including field returns.
- Delivery schedule performance, including incidents of premium freight.
- Change management.
- Risk management (including component obsolescence risk).
- John Deere notifications related to quality or delivery issues.

8.4.2.3.2 Suppliers shall take appropriate actions with second tier suppliers in case of any non-conformances.

8.4.2.3.3 A structured process to define required second-party audits at the supplier shall be in place, and audits shall be performed accordingly.

8.4.2.3.4 Suppliers may utilize John Deere audit forms for qualification of the second-tier supply chain.

8.4.2.4 Supplier Development

For active suppliers, a supplier development plan shall be defined as appropriate, based on the following criteria:

- Issues identified through supplier monitoring.
- Findings from second party audits.
- Risk analysis.
- Status of potential third-party quality management system certification.

8.4.2.5 Supplier Communication and Involvement

8.4.2.5.1 It can be appropriate for the supplier to have second tier suppliers participate in John Deere initiated DPAR and in other quality activities.

8.4.2.5.2 The supplier shall have a communication plan to notify second tier supply chain of the latest specifications and to verify the product on an ongoing basis.

8.4.2.5.3 A change in the supply chain, or any design or process change by the supply chain which produces John Deere products, shall require a SCR submission followed by the appropriate quality planning prior to implementation.

8.4.2.5.4 Documented approval from John Deere shall be required prior to change.

8.4.3 Information for External Providers

8.4.3.1 ISO 9001:2015 clause 8.4.3 requirements shall apply.

8.4.3.1.1 Supplier purchasing documents shall contain information describing the requirements for approval of the product and for the qualification of the procedures, processes, specifications, equipment and personnel necessary to produce the product.

8.4.3.1.2 The supplier shall communicate all applicable statutory and regulatory requirements, and special product and process characteristics to second tier suppliers, and require the second tier suppliers to cascade all applicable requirements down the supply chain to the point of manufacture.

8.4.3.2 Incoming Product Conformity to Requirements

8.4.3.2.1 The supplier shall have a process to ensure the quality of purchased products.

8.4.3.2.2 The process shall include one or more of the following:

- Receipt of and evaluation of statistical data by the supplier.
- Receiving inspections or testing such as sampling based on performance.
- Second or third party assessments of supplier sites, when coupled with records of acceptable delivered product conformity to specifications.
- Part evaluation by a designated laboratory.
- Another method agreed upon by John Deere.

8.5 Production and Service Provision

8.5.1 Control of Production and Service Provision

ISO 9001:2015 clause 8.5.1 requirements shall apply.

8.5.1.1 Control Plan

The supplier shall develop control plans that contain the following:

- Processes at the system, subsystem, component, or material level for the product supplied.
- Process producing bulk materials as well as parts.
- A plan for pre-launch and production which considers the DFMEA and PFMEA outputs.
- All elements specified by John Deere.

Note 24 See JDS-G223X3 for additional information.

8.5.1.2 Validation of Processes for Production and Service Provision

The supplier shall validate all special processes (for example, welding, heat treatment, plating, and, painting).

Note 25 A list of special processes can be found on JDSN.

8.5.1.3 Preventive Maintenance

8.5.1.3.1 The supplier shall develop, implement, and maintain a documented preventive maintenance system.

8.5.1.3.2 The maintenance system shall include, but is not limited to, production machines, tooling, and test equipment.

8.5.2 Identification and Traceability

8.5.2.1 ISO 9001:2015 clause 8.5.2 requirements shall apply.

8.5.2.2 The supplier shall have product traceability to allow for parts to be matched to a certain time frame, processes, and specific lots of material, so that when a discrepancy is found, product can be contained, and corrective action can be initiated.

8.5.2.3 When non-conforming product is identified, John Deere and the supplier shall identify and trace suspect parts.

8.5.3 Property Belonging to John Deere or External Providers

ISO 9001:2015 clause 8.5.3 requirements shall apply.

8.5.4 Preservation

8.5.4.1 ISO 9001:2015 clause 8.5.4 requirements shall apply.

8.5.4.2 The supplier shall preserve conformity of product with John Deere requirements during internal processing and delivery to the intended destination.

8.5.4.3 Preservation shall include identification, handling, packaging, storage, and protection, and preservation shall also apply to the constituent parts of a product. The supplier should observe FIFO.

8.5.4.4 Unless otherwise specified or communicated by the John Deere representative, all products shall be visually clean, free from visible corrosion upon delivery to the intended destination, and shall withstand 90 days of non-climate controlled indoor storage without the development of visible corrosion.

8.5.4.5 Packaging shall meet all applicable shipping laws, codes, and regulations, and packaging shall meet all requirements imposed by John Deere. The supplier should ensure John Deere owned packaging is maintained to be clean and free from dirt, debris, foreign materials, and damage, while packaging is under supplier control.

8.5.4.6 Service parts shall be prepared in accordance with JDV 9.

8.5.4.7 Obsolete product shall be controlled in a similar manner to that of non-conforming product.

8.5.5 Post Delivery Activities

ISO 9001:2015 clause 8.5.5 requirements shall apply.

8.5.6 Control of Changes

ISO 9001:2015 clause 8.5.6 requirements shall apply.

8.5.6.1 John Deere Notification and Submission Requirements

8.5.6.1.1 The supplier shall obtain approval from John Deere prior to making changes to a specification or process for supplied products or services for any change that can impact safety, fit, form, function, performance, durability, or appearance per the requirements listed in Table 7.

8.5.6.1.2 The supplier shall notify the responsible John Deere design unit of any design or process changes as indicated in Table 7 by using the SCR system on JDSN.

8.5.6.1.3 Individual John Deere using units can subsequently elect to require a submission for PPAP approval. Table 7, which is derived from the AIAG Production Part Approval Process Manual, specifies when notification is required.

8.5.6.2 The supplier shall agree with any change requests from second tier suppliers prior to submitting a SCR to John Deere.

8.5.6.3 John Deere requires approval prior to implementation for items listed in Table 7.

Table 7 Planned Changes Requiring Approval Prior to Implementation

Requirement	Clarification or Examples
1. Use of other construction or material that was used in the previously approved part or product.	For example, other construction as documented on a deviation (permit) or included as a note on the design record and not covered by an engineering change.
2. Production from new or modified tools (except perishable tools), dies, molds, patterns, etc., including additional or replacement tooling.	The requirement only applies to tools, which due to their unique form or function can be expected to influence the integrity of the final product. The requirement is not meant to describe standard tools (new or repaired), such as standard measuring devices, or drivers (manual or power).
3. Production following refurbishment or rearrangement of existing tooling or equipment.	Refurbishment includes the reconstruction , modification, or a combination of both to a tool or machine, or to increase the capacity, performance, or change the existing function. This is not meant to be confused with normal maintenance, repair or replacement of parts for which no change in performance is to be expected, and post repair verification methods have been established. Rearrangement is defined as activity which changes the sequence of product/process flow from that documented in the process flow diagram (including the addition of a new process). Minor adjustments of production equipment can be required to meet safety requirements such as, installation of protective covers, and elimination of potential electrostatic discharge risks. These changes can be made without John Deere approval unless the process flow is changed as a result of this adjustment.
4. Production from tooling and equipment transferred to a different plant location or from an additional plant location.	Production process tooling and equipment transferred between buildings or facilities in one or more locations.
5. Change of supplier for parts, non-equivalent materials, or services (for example, heat-treating, painting, or plating) that affect John Deere fit, form, function, durability, or performance requirements.	Suppliers are responsible for approval of subcontracted material and services that do not affect John Deere fit, form, function, durability, or performance requirements.

Table 7 continues on next page.

Table 7 Planned Changes Requiring Approval Prior to Implementation

6. Product produced after the tooling has been inactive for volume production for twelve months or more.	For product which has been produced after tooling has been inactive for twelve months or more, notification is required when the part has had no active purchase order, and the existing tooling has been inactive for volume production for twelve months or more. The only exception is when the part has low volume, for example, service or specialty vehicles. However, John Deere may specify certain PPAP requirements for service parts.
7. Product and process changes related to components of the production product manufactured internally or manufactured by suppliers that impact safety, fit, form, function, performance, durability, or appearance of the salable product. Additionally, the supplier shall concur with any requests by a subcontractor before submission to John Deere.	Any change which affects John Deere requirements for safety, fit, form, function, performance, durability, or appearance requires notification to John Deere. The safety, fit, form, function, performance, durability, or appearance requirements should be part of the John Deere specifications, as agreed on during reviews.
8. For bulk materials only. New source of raw material with special characteristics from new or existing subcontractor. Change in product appearance attributes where there is not an appearance specification. Revised parameters in the same process (outside PFMEA parameters of the approved product, including packaging). Change outside of DFMEA (product composition, ingredient levels) of the approved product.	These changes would normally be expected to influence the performance of the product.
9. Change in test inspection method or new technique (no effect on acceptance criteria).	For change in test method, supplier should have evidence that the new method provides results equivalent to the old method.

8.6 Release of Products and Services

8.6.1 ISO 9001:2015 clause 8.6 requirements shall apply.

8.6.2 Prior to the start of production, a control plan shall be completed, and shall be reviewed by John Deere for approval.

8.6.3 There shall be documentation showing evidence that the control plan is being executed by the owners of the processes.

8.6.4 PPAP acceptance shall be completed prior to shipping parts to John Deere.

8.6.5 Appearance Items

For supplier's manufacturing parts designated by John Deere as appearance items, the supplier shall provide the following:

- Appropriate resources for evaluation (for example, enhanced lighting).
- Masters (on the same base material) for color, grain, gloss, metallic brilliance, texture, and distinctness of image (DOI), as appropriate.
- Maintenance and control of appearance masters and evaluation equipment.
- Verification that personnel making appearance evaluations are competent and qualified.

8.7 Control of Non-Conforming Outputs

8.7.1 General

8.7.1.1 ISO 9001:2015 clause 8.7.1 requirements shall apply.

8.7.1.2 The control of non-conforming outputs shall provide for identification, documentation, evaluation, isolation, disposition of non-conforming products, and notification to the departments concerned (both internal and external).

8.7.1.3 The supplier shall immediately inform John Deere when non-conforming product has been shipped.

8.7.1.4 When parts are found to be non-conforming at John Deere, the supplier shall provide the resources necessary to evaluate, contain, sort, and, reclaim or scrap the non-conforming product.

8.7.1.5 The supplier shall have a representative establish containment at the John Deere unit, for material in transit, and at the supplier within 24 hours. Quicker response may be required based on the severity of the situation.

8.7.1.6 When containment of non-conforming product is unsuccessful, then a third-party inspection may be required by John Deere, to be performed at the supplier's expense.

8.7.1.7 When non-conforming material is shipped to John Deere units or become a warranty issue, the supplier shall be responsible to assist John Deere in evaluating and correcting the issue.

8.7.1.8 John Deere shall be entitled to recover from the supplier all costs and expenses reasonably incurred in taking corrective action, per the terms and conditions of the contract.

8.7.1.9 Product with unidentified or suspect status shall be classified as non-conforming product.

8.7.1.10 The supplier shall ensure that all appropriate personnel from areas affected receive training for handling and containment of suspect and non-conforming product.

8.7.1.11 Control of Reworked or Repaired Product

8.7.1.11.1 All rework, modification, or repair shall be agreed upon with John Deere, and shall only be allowed when there is no influence on the reliability or major customer requirements.

8.7.1.11.2 Instructions for rework and repair, including re-inspection requirements, shall be accessible to and utilized by appropriate personnel.

8.7.1.11.3 Reworked and repaired product shall pass appropriate functional tests in accordance with the original control plans.

8.7.1.11.4 All serialized product shall have documented records of rework or repair. See clause 8.5.2.

8.7.1.12 John Deere Deviation

8.7.1.12.1 When the supplier wants to ship product not meeting the specified requirements, written approval shall be obtained from John Deere prior to shipment of the product.

8.7.1.12.2 The request shall be made using the Engineering Deviation Authorization Checklist and Form (see JDSN), and shall apply equally to products or services purchased from the supply chain.

8.7.1.12.3 Deviations shall be temporary approvals, and permanent changes shall follow the SCR process.

8.7.1.12.4 The supplier shall maintain a record of the deviation expiration date and quantity authorized by any John Deere deviation.

8.7.1.12.5 The supplier shall ensure that compliance is met in accordance with the original or superseding product specifications and requirements when the deviation expires.

8.7.1.12.6 Full traceability shall be guaranteed, including documentation of serial numbers (when available), and each shipping container of deviated product shall be properly identified with the John Deere deviation number.

8.7.2 Nonconforming Outputs Documentation

ISO 9001:2015 clause 8.7.2 requirements shall apply.

9 Performance Evaluation

9.1 Monitoring, Measurement, Analysis, and Evaluation

9.1.1 General

9.1.1.1 ISO 9001:2015 clause 9.1.1 requirements shall apply.

9.1.1.2 Process control documents shall be in place prior to initial production and shall be readily available to the employees responsible for the operation of the process.

9.1.1.3 The key processing parameters, process special characteristics, and product special characteristics identified during design reviews, FMEA, and DPAR shall be addressed in the process control documents, including a control plan.

9.1.1.4 Process control documentation and control plans shall be available for review by John Deere.

9.1.1.5 The minimum process capability is a Ppk ≥ 1.33 or Cpk ≥ 1.33. Higher process capability requirements may be specified by John Deere.

9.1.1.6 Other quality indices, such as a capability index (Cpm), may be utilized depending on the process being monitored. Review with a John Deere quality engineer for requirements.

9.1.1.7 Capability studies shall use a minimum of 30 consecutive pieces taken from a stable, in control process unless John Deere specifies otherwise.

9.1.1.8 There shall be written procedures describing actions to take when out-of-control conditions exist.

9.1.1.9 Review of process monitoring techniques shall be made available to John Deere personnel upon request.

Note 26 Refer to ISO 22514 Statistical methods in process management – Capability and performance (all parts) and AIAG SPC Manual for additional information and instruction on statistical analysis.

9.1.2 John Deere Satisfaction

9.1.2.1 ISO 9001:2015 clause 9.1.2 requirements shall apply.

9.1.2.2 John Deere uses the Achieving Excellence process (with associated metrics) and warranty data to measure satisfaction with the supplier's performance. Supplier shall use the available Achieving Excellence data to drive improvements in John Deere's satisfaction metrics. See JDSN.

9.1.2.3 The supplier shall include a review of the applicable John Deere performance metrics in the review of the quality management system.

9.1.2.4 Trends in John Deere performance metrics should be reviewed, and improvement activities developed around the data.

9.1.2.5 John Deere performance improvement activities should utilize a structured process improvement technique.

9.1.2.6 Summarized quality performance should be made available to all the supplier's employees.

9.1.2.7 Internal supplier quality performance data shall be made available to John Deere upon request within 24 hours.

9.1.2.8 At a minimum, the supplier shall analyze the following:

- Achieving Excellence results.
- Internal and external product failures (including warranty).
- Process or product quality trends.
- Supplier's supply chain quality performance (including the supplier's supply chain).

9.1.2.9 Suppliers shall monitor warranty performance on JDSN, and shall initiate warranty improvement activities based on warranty trends and analysis results.

9.1.2.10 Suppliers shall be responsible for requesting specific warranty parts needed for investigations, and shall support John Deere in warranty reviews when requested by John Deere.

9.1.3 Analysis and Evaluation

ISO 9001:2015 clause 9.1.3 requirements shall apply.

9.1.4 Measurement, Analysis, and Improvement

9.1.4.1 Measurement, analysis, and improvement are the process of planning, defining, and using performance metrics in processes and products critical to John Deere. These performance metrics shall be used to determine the current level of performance, drive continuous improvement activities, and monitor long-term performance levels.

9.1.4.2 When the manufacturing processes do not allow demonstration of product compliance through process capability, alternate methods such as batch conformance to specification may be used. Contact the John Deere quality engineer for requirements.

9.1.4.3 Suppliers shall maintain manufacturing process capability or performance results as specified by John Deere's part approval process requirements.

9.1.4.3.1 Suppliers shall verify that the process flow diagram, PFMEA, and control plan are implemented, including adherence to the following:

- Measurement methods.
- Sampling requirements.
- Acceptance requirements.
- Records of actual measurement values or test results per measurement method.
- Reaction plans and escalation process when acceptance requirements are not met.

9.1.5 Identification of Statistical Concepts

9.1.5.1 Statistical tools are critical to the use of performance metrics. The statistical tools are used on processes and products, and also measure John Deere satisfaction and supply chain performance.

9.1.5.2 Where indicated by the OFP Flowchart (see Figure 2), statistical process control charting should be used on key process control variables in order to eliminate the possibility of producing deficiencies. The charting of the monitored variables should be completed by the persons able to act on the process.

9.1.5.3 Review of process monitoring techniques shall be made available to John Deere personnel upon request.

9.1.6 Application of Statistical Concepts

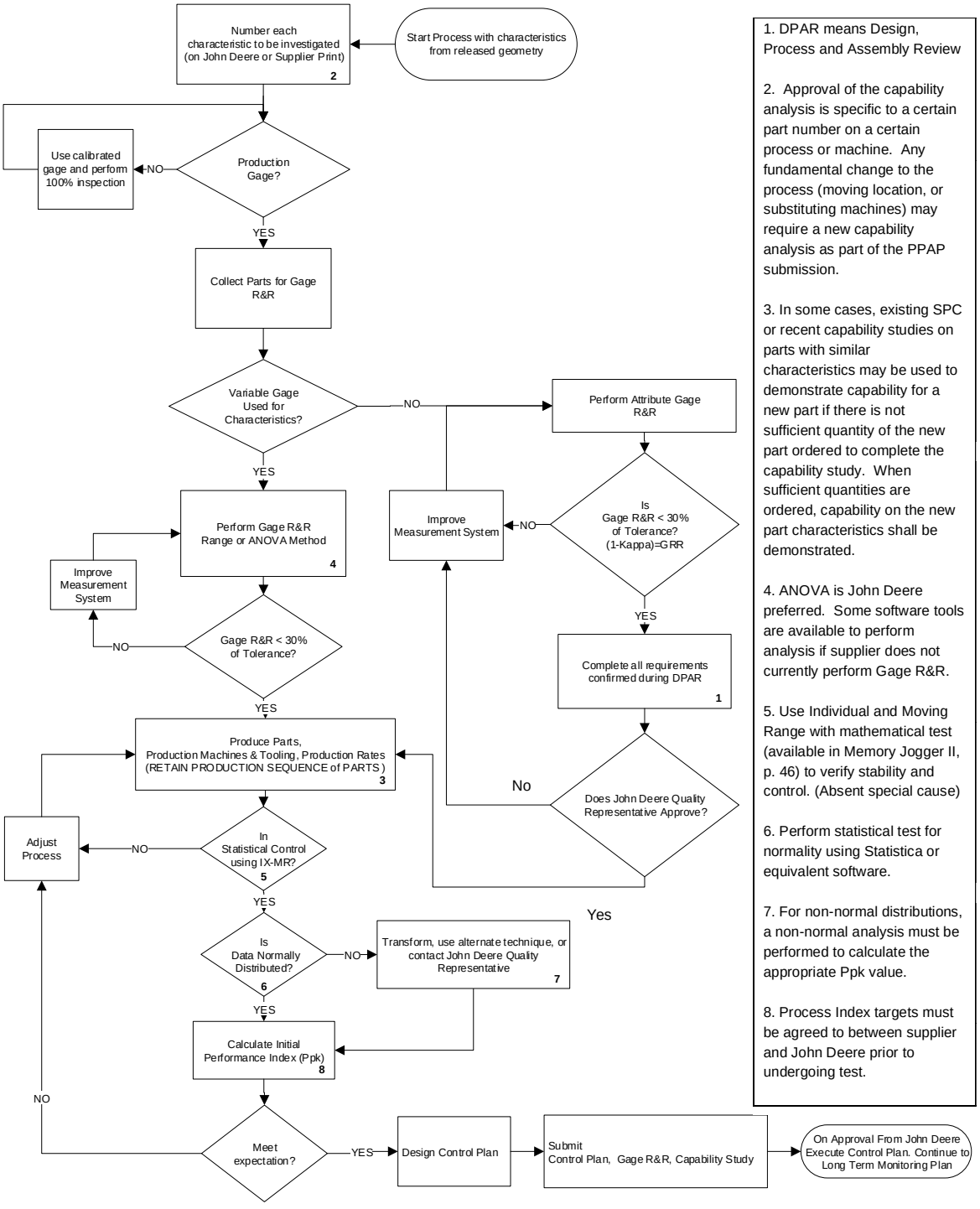
9.1.6.1 Basic statistical concepts, such as variation control (stability), process capability, and over-adjustment shall be understood and shall be utilized throughout the supplier's supply chain.

9.1.6.2 Potential process control methods are identified in Table 8. The appropriate method shall be identified and agreed to by John Deere. See ISO 2859 and ISO 3951.

9.1.6.3 When minimum initial process capability for a special characteristic has not been demonstrated, the PDP and initial production flowchart in Figure 1 shall be used to determine required activities.

Table 8 Process Control Methods

Process control methods can include, but are not limited to the following:	
Control Method	**Description**
Acceptance Sampling	A sampling technique in which units of product are drawn from a specific lot. The information from these samples is used as a basis for making acceptance decisions concerning parts or processes. This method can be used for large numbers of parts from discreet batches.
Continuous Sampling	This method requires that a consecutive number of pieces pass inspection before starting normal sampling cycles. This method can be used when the product stream is continuous in processes such as painting, welding, assembly, and machining.
Modified SPC	Modified control charts have control limits that are not established by conventional, control limit-setting techniques. Modified control charts are sometimes referred to as acceptance control charts. They can establish whether, or not, a process can satisfy product or service tolerances, and is “in a state of statistical control”. It is generally assumed that assignable causes can create shifts in the process level. These shifts should be small enough, in relation to tolerance requirements, to be considered uneconomical to control with conventional SPC Charts.
Pre-Control	Pre-control is effective for any process where the quality characteristic of interest can be adjusted. The process can have either a continuous output, (for example, heat-treat furnace data) or a discrete output (e.g., machine parts). There are no additional requirements and no underlying assumptions concerning capability, or normality of the quality characteristic. This method can be used temporarily, as a precursor to a conventional SPC chart, or as a permanent control method. See Juran’s Quality Handbook: The Complete Guide to Performance Excellence.
Restudy	Measurement data is used to verify process capability and C_{pk} on a periodic basis.
Setup Check	Part characteristics are checked whenever the process is set-up and at periodic intervals. Examples include CMM checks, roundness checks, and gear geometry checks.
Short-Run SPC	Short-run SPC is used for small lot sizes of parts with characteristics common to a process. Each characteristic is transformed and plotted with other characteristics on the same chart , see SPC for Short Production Runs reference handbook) For additional information reference SPC for Short Runs.
SPC Control Charts	SPC control charts are used as a basis to make decisions about a process. Control determinations are made by comparing the values of statistical measures of an ordered series of samples, or subgroups, with control limits. Examples include p, np, c, u, Xbar & s, Xbar & R, and IXMR. SPC control charts demonstrate whether, or not, the process is "in control". SPC control charts can be used in an acceptance sense, calling for action or investigation when a process shifts from the standard level. SPC control charts can be used with variable or attribute data. These continuous control methods are appropriate for error-proofing when abnormal process variations are not present (Committee E11 on Quality and Statistics, Statistical Quality Control Handbook, and, Statistical Quality Control Handbook.
Tool Control	A control method where the first part is checked after a new tool is installed. When the part checks OK, the process is run for the expected life of the tool. The last part produced with the old tool is then checked. When it is OK, then all the parts are OK.



1. DPAR means Design, Process and Assembly Review

2. Approval of the capability analysis is specific to a certain part number on a certain process or machine. Any fundamental change to the process (moving location, or substituting machines) may require a new capability analysis as part of the PPAP submission.

3. In some cases, existing SPC or recent capability studies on parts with similar characteristics may be used to demonstrate capability for a new part if there is not sufficient quantity of the new part ordered to complete the capability study. When sufficient quantities are ordered, capability on the new part characteristics shall be demonstrated.

4. ANOVA is John Deere preferred. Some software tools are available to perform analysis if supplier does not currently perform Gage R&R.

5. Use Individual and Moving Range with mathematical test (available in Memory Jogger II, p. 46) to verify stability and control. (Absent special cause)

6. Perform statistical test for normality using Statistica or equivalent software.

7. For non-normal distributions, a non-normal analysis must be performed to calculate the appropriate Ppk value.

8. Process Index targets must be agreed to between supplier and John Deere prior to undergoing test.

Figure 1 PDP and Initial Production — Process Flow Chart

9.1.6.4 Where indicated by the Order Fulfillment Process Flowchart in Figure 2, statistical process control charting should be used on key process control variables in order to eliminate the possibility of producing deficiencies. The charting of the monitored variables should be completed by the persons able to act on the process.

9.1.6.5 Review of process monitoring techniques shall be made available to John Deere personnel upon request.

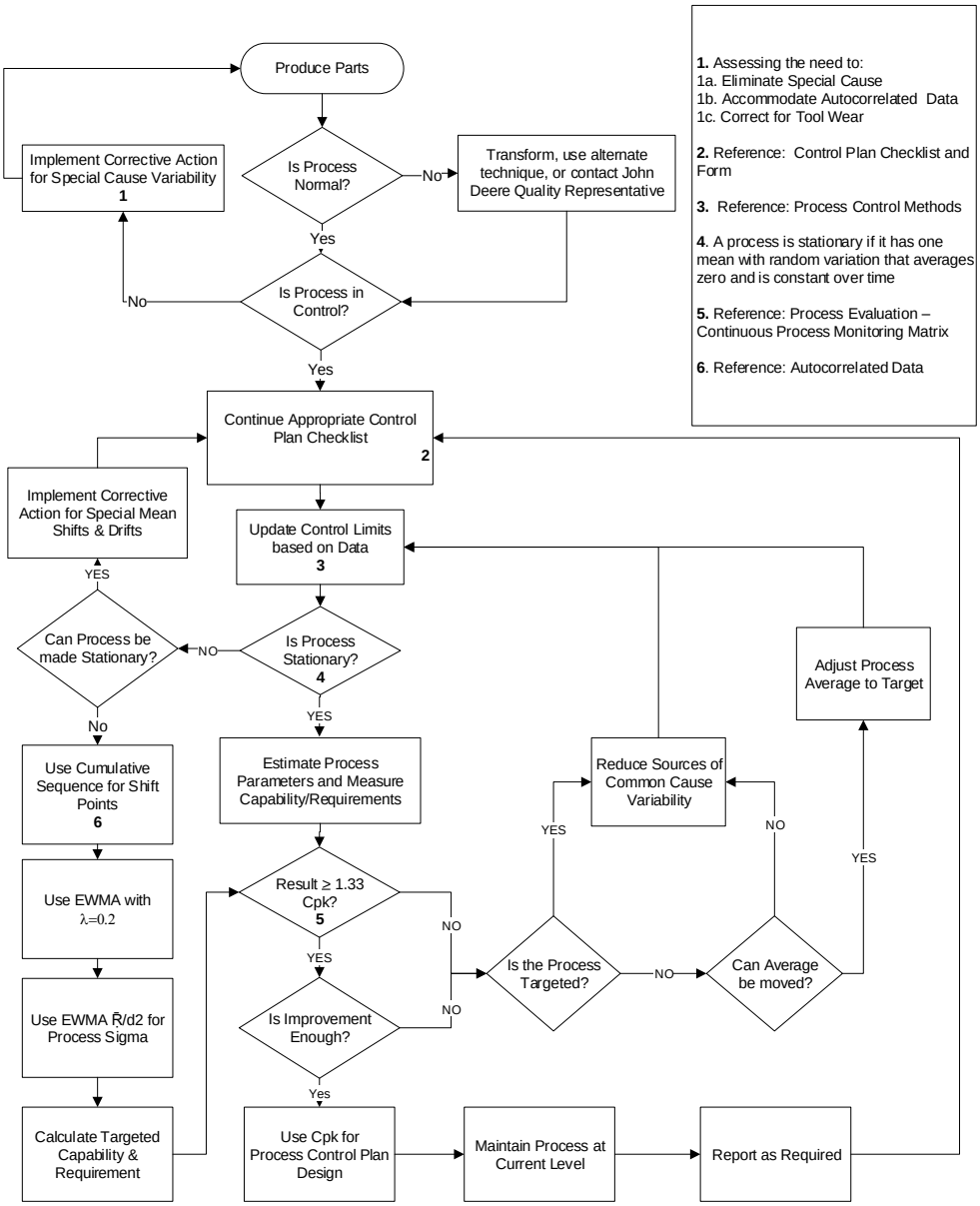


Figure 2 Order Fulfillment Process — Process Control Flow Chart

9.1.6.6 Manufacturing processes susceptible to tool wear and auto correlated data should consider using the analytical methods.

9.1.6.7 There shall be written procedures describing actions to take when out-of-control conditions exist. Table 9 and Table 10 provide minimum John Deere requirements. Table 11 provides additional clarification of various cases.

Table 9 Continuous Process Monitoring Matrix

		Process Potential — Pp or C_p		
		C_p < 1.0 or Unknown	**1.0 ≤ Cp < 1.33**	**C_p ≥ 1.33**
Process Capability — Ppk or Cpk	Cpk < 1.0 or Unknown	Mean and Variability, See Case 1 100 % inspection and corrective action required	Mean or Variability or both, See Case 2 100 % inspection and corrective action required	Mean Only, See Case 3 100 % inspection and corrective action required
	1.0 ≤ Cpk < 1.33	Not Possible	Mean or Variability or both See Case 4 Control charting and sampling required	Mean Only, See Case 5 Control charting required
	Cpk ≥ 1.33	Not Possible	Not Possible	Auditing of Both, See Case 6 Routine audits required

- Pp and Cp or Ppk and Cpk are interchangeable for interpreting Table 9.

Table 10 Case and Action Plans

Case	Action Plans
1,2,3	Nonconforming product is known to occur; these cases imply rework or scrap conditions. 100 % inspection and a corrective action plan are required. Reduce the tolerance by half of the Gage R&R (expressed as a percent of the tolerance applied). Case 1 — The first priority is reduction of variability. Reduce the variability until the process potential is approximately one. Targeting the mean is the second priority. Case 2 — The first priority is targeting the mean. Variability reduction is the second priority when Process Potential nears Process Capability. Case 3 — The first priority is targeting the mean. Variability reduction is unnecessary when properly targeted.
4	Improvement of targeting and reduction of variability is required. First, target the process using EMWA and CuSum — Means Testing. Once process potential equals process capability, switch the priority to using traditional SPC for variability audits and variability reduction. The goal is to get to Case 5.
5	Improvement of targeting is required. First, target the process using EWMA and CuSum — Means Testing. Once process potential equals process capability, Case 6 is achieved.
6	The process is targeted, capable, and in control. Conduct routine audits and infrequent capability studies (using $\overline{R} / d_2$ from traditional SPC methods). Audit frequency is determined based on the ability to recall nonconforming material when audits result in finding such material.

Table 11 Case Representation and Requirements

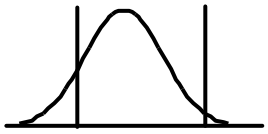
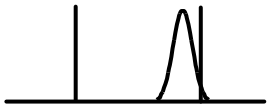
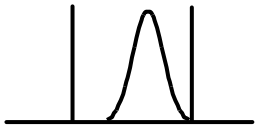
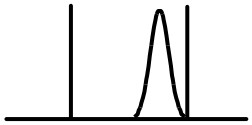
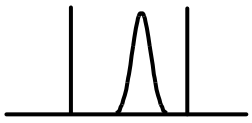
Case	Graphical Representation	Description
		Requirement
CASE 1 Cp < 1.0 Cpk < 1.0 or Unknown		This process is not able to continuously produce parts conforming to specifications. Typical SPC cannot help until the process is fixed for both the mean and the variability. When the process capability is unknown, data collection is required to determine the capability of the process.
		These conditions require 100 % inspection and a corrective action plan to improve the process. John Deere written approval is needed prior to shipping parts.
CASE 2 1.0 ≤ Cp < 1.33 Cpk < 1.0		This process is not able to continuously produce parts conforming to specifications. The primary issue is targeting. Mean control is the primary goal.
		This condition requires 100 % inspection and a corrective action plan to improve the process. John Deere written approval is needed prior to shipping parts.

Table 11 Case Representation and Requirements

Case	Graphical Representation	Description Requirement
CASE 3 $C_p \geq 1.33$ Cpk < 1.0		This process is not able to continuously produce parts conforming to specifications. John Deere written approval is needed prior to shipping parts. The primary issue is targeting. Mean control is the primary goal.
		This condition requires 100 % inspection and a corrective action plan to improve the process. John Deere written approval is needed prior to shipping parts. Audit variance using SPC.
CASE 4 $1.0 \leq Cp < 1.33$ $1.0 \leq Cpk < 1.33$		This process is capable of producing parts that conform to specifications, but can or cannot be targeted at the nominal specification value. An attempt should be made to determine the special causes that are prohibiting the process from being centered or are creating excess variation. The primary issue is targeting. Variance shall be monitored and reduced.
		Charting (SPC, pre-control, or run charting) to verify the parts being produced conform to design specifications, and a sampling plan to inspect parts per a frequency interval shall be executed. The interval is determined by the Cp value — the greater the Cp value, the less frequent the parts have to be checked. Evidence of < 0.27 % defective parts is required.
CASE 5 $C_p \geq 1.33$ $1.0 \leq Cpk < 1.33$		This process is capable of producing parts that conform to specifications, but can or cannot be targeted at the nominal specification value. An attempt should be made to determine the special cause(s) that are prohibiting the process from being centered or are creating excess variation. The primary issue is targeting. Variance shall be monitored.
		Charting (SPC, pre-control, or run charting) shall be used to verify the parts being produced conform to design specifications. Evidence of < 0.27 % defective parts is required.
CASE 6 $C_p \geq 1.33$ Cpk ≥ 1.33		This process is capable, well centered, and in control. Parts produced are conforming. There is little concern of nonconforming product.
		At a minimum, such a process should be verified as appropriate by inspecting the parts being produced, such as during the quartile marks for each run (first, 25 %, 50 %, 75 %, and last piece).

9.1.6.8 Capability and variability studies shall be maintained in accordance with the order fulfillment process on all special characteristics (see Figure 2), and shall be maintained on other characteristics identified by John Deere and the supplier in the quality planning process.

9.1.6.9 For new or changed parts or processes, product conformance is driven by process control flow chart, PDP and initial production. See Figure 1 and Figure 2.

9.2 Internal Audit

9.2.1 General

ISO 9001:2015 clause 9.2.1 requirements shall apply.

9.2.2 Quality Management System Audit

9.2.2.1 ISO 9001:2015 clause 9.2.2 requirements shall apply.

9.2.2.2 The supplier shall audit the quality management system to verify compliance with JDS-G223, and any additional quality management system requirements.

9.2.2.3 A formal corrective action process shall include root cause determination to correct deficiencies.

9.2.2.4 The supplier shall have qualified internal auditors who are independent of area being audited perform the audits.

9.2.2.5 The supplier's management shall review the supplier's quality management system at planned intervals to ensure continuing suitability, adequacy, and effectiveness.

9.2.3 Manufacturing Process Audit

9.2.3.1 The supplier shall audit each manufacturing process to determine the process effectiveness.

9.2.3.2 The work performed includes manufacturing operations at the supplier's facility and operations subcontracted to the supplier's supply chain. This audit may also be performed on similar parts when the work has not yet been sourced, or when preparing for full production.

9.2.3.3 Product Audit

9.2.3.3.1 The supplier shall audit products at appropriate stages of production and delivery to verify conformity to all specified requirements, such as product dimensions, functionality, packaging and labeling.

9.2.3.3.2 Product audits should be conducted at a defined frequency to ensure compliance to John Deere requirements.

9.3 Management Review

9.3.1 General

ISO 9001:2015 clause 9.3.1 requirements shall apply.

9.3.2 Management Review Inputs

9.3.2.1 ISO 9001:2015 clause 9.3.2 requirements shall apply.

9.3.2.2 At a minimum, management review shall be conducted annually. The frequency of management reviews shall be increased based on risk to compliance with customer requirements resulting from changes impacting the quality management system or performance related issues.

9.3.2.3 Input to the management review shall include the following:

- John Deere feedback (such as Achieving Excellence and warranty).
- Cost of poor quality (cost of internal and external nonconformance).

9.3.3 Management Review Outputs

9.3.3.1 ISO 9001:2015 clause 9.3.3 requirements shall apply.

9.3.3.2 Outputs shall include action plans for improvement of product related to customer satisfaction when targets are not met.

10 Improvement

10.1 General

ISO 9001:2015 clause 10.1 requirements shall apply.

10.2 Non-Conformity and Corrective Action

10.2.1 ISO 9001:2015 clause 10.2.1 requirements shall apply.

10.2.2 ISO 9001:2015 clause 10.2.2 requirements shall apply.

10.2.3 Problem Solving

10.2.3.1 The supplier shall have a documented process for problem solving. The supplier shall use an Eight Corrective Action Disciplines (8D) process, or equivalent. See Table 12.

10.2.3.2 A status update shall be submitted via the NCCA system via (JDSN), and each corrective action D-step shall be completed by the target dates.

Table 12 Eight Corrective Action Disciplines (8D) Process

Discipline	Activities
D1 Establish the Team	• Define the members of the team which can successfully resolve the problem.
D2 Problem Identification	• Document all facts, research and field information which would quantify or describe the problem in detail.
D3 Containment Action and Short Term Corrective Action	• Isolate the effect of the problem from John Deere until corrective action is implemented. To minimize the effect of any non-conforming product by containment, re-inspection and rework, to verify conformance of current product. • Identify and contain non-conforming product at all locations including, but not limited to in-house at supplier facility, in-transit material, material located at various John Deere sites including Parts Depots, dealers, and end-use customer. • Containment shall be completed within 24 hours of problem notification.
D4 Define and Verify Root Cause	• Scientific, complete breakdown of the direct cause, contributing causes and root causes of the problem. • 3 Legged 5 Whys.
D5 Choose and Verify Solution	• Identification of solutions or actions that shall eliminate the root causes as well as the contributing causes. • Quantitative results confirming that the selected corrective actions shall resolve the issue for John Deere.
D6 Implement Permanent Corrective Action	• Action taken shall correct the root cause of the problem and prevent the recurrence. • Implementation includes listing action steps, identifying responsible people and target dates for each action. • This action shall be completed by the target date as specified by John Deere.

Table 12 Eight Corrective Action Disciplines (8D) Process

Discipline	Activities
D7 Prevent Recurrence	• Modifications to management and operating systems, practices, and procedures such as control plans, DFMEA, PFMEA, work instructions, training plans, training performed, and engineering documentation to prevent recurrence of this and all similar problems. • The responsible person or 8D Team reviews all activity performed and confirms that all steps have been completed. • The improvements resulting from the 8D process should be replicated to like processes or products, to ensure that the problem does not recur.
D8 Team Recognition	• Acknowledgement from Management of the good work done by the 8D team. • This step is to recognize extra effort and reinforce successful behavior.

10.2.4 Error-Proofing

10.2.4.1 Error-proofing activities should be the first method of control considered. When error-proofing is not feasible, statistical techniques shall be used to monitor the process.

10.2.4.2 Details should be documented in the process risk analysis (such as PFMEA), and test frequencies shall be documented in the control plan.

10.2.5 Warranty Management Systems and Field Failure Analysis

10.2.5.1 The supplier shall have a warranty management system.

10.2.5.2 The supplier shall include a method for warranty part analysis, including no-trouble-found.

10.2.5.3 The supplier shall perform analysis on returned parts, and shall initiate problem solving and corrective action to prevent recurrence.

10.2.5.4 Analysis should include interaction of software within the system where appropriate.

10.2.5.5 Results of the testing and analysis shall be provided to John Deere, and shall be communicated within the supplier's organization.

10.3 Continual Improvement

10.3.1 ISO 9001:2015 clause 10.3 requirements shall apply.

10.3.2 The supplier shall demonstrate a commitment to continuous improvement in products, processes, and services provided to John Deere.

10.3.3 The supplier shall have a formal continuous improvement process.

Note 27 The goal should be to reduce defects, scrap, and re-work to improve safety, reduce cost and RPN, and to improve operation efficiency and production capacity. Quality system emphasis is placed on preventing rather than detecting non-conformity.

10.3.4 Processes should be developed to ensure that employees are enabled to do the job right every time. The processes include, but are not limited to the following:

- Data collection systems.
- Process control plans.
- Error-proofing techniques.
- Training.
- Continuous improvement actions.
- Design and Process FMEA.

11 References

For undated references, the latest edition of the referenced document (including any amendments) applies.

11.1 Access to John Deere Standards

11.1.1 John Deere Standards can be accessed by John Deere personnel via the Engineering Standards internal website.

11.1.2 Employees of suppliers with an approved John Deere supplier number can obtain access to John Deere Standards via the JD Supply Network (JDSN). Access to JDSN is by approved individual name and password. Suppliers should contact their Supply Management representative with questions about JDSN.

Note 28 Only John Deere Standards which have been approved for supplier distribution are available via JDSN.

11.2 Access to Standards from External Organizations

11.2.1 Most standards from organizations external to John Deere are available to John Deere personnel via the Engineering Standards internal website.

11.2.2 Suppliers are responsible for obtaining relevant external standards. In accordance with copyright laws and Company policy, John Deere personnel shall not provide copies of these standards to suppliers.

11.3 References Cited in This Standard

11.3.1 John Deere Standards

JDV 9	Preparation and Packaging of Service Parts

11.3.2 AIAG Standards (Automotive Industry Action Group)

AIAG FMEA	Failure Mode and Effects Analysis (FMEA) Potential Failure Mode and Effects Analysis for Tooling and Equipment (Machinery FMEA)
AIAG VDA	“Failure Mode and Effect Analysis — FMEA Handbook”

11.3.3 ASTM Committee 11

ASTM Committee 11: 1975	Committee E11 on Quality and Statistics

11.3.4 IATF Standards (International Automotive Task Force)

IATF 16949	Quality management systems — Particular requirements for the application of ISO 9001:2015 for automotive production and relevant service part organizations

11.3.5 ISO Standards (International Organization for Standardization)

ISO 10005:2018	Quality management - Guidelines for quality plans
ISO 22514	Statistical methods in process management — Capability and performance (all parts)
ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories
ISO 9001: 2015	Quality management systems — Requirements

11.3.6 Other Publications

AIAG MSA Manual	Automotive Industry Action Group — (MSA) Measurement System Analysis
AT&T (1985)	AT&T, *Statistical Quality Control Handbook* 11th Edition, North Carolina, Delmar Printing, 1985
Bothe (2011)	Bothe, D.R., *SPC for Short Production Runs Reference Handbook* 9th Edition, Cedarburg, WI: International Quality Institute
Fleiss, Levin, & Paik (2003)	Fleiss, J.L., Levin, B., & Paik, M.C., *Statistical Methods for Rates and Proportions,* 3rd Edition New York: John Wiley & Sons, Inc., 2003
International Quality Institute	International Quality Institute, Inc., *SPC for Short Runs,* Cedarburg, WI, International Quality Institute
Juran & De Feo (2010)	Juran, J.M. & De Feo, J.A., *Juran's Quality Handbook: The Complete Guide to Performance Excellence* 6th Edition, New York: McGraw-Hill, 2010
Kazmierski (1995)	Kazmierski, T.J., *Statistical Problem Solving in Quality Engineering,* New York: McGraw-Hill, 1995
Western Electric (1982)	Western Electric, *Statistical Quality Control Handbook* 2nd Edition, North Carolina, Delmar Printing, 1982
Joint Committee for Guidelines in Metrology (JCGM)	Evaluation of measurement data — Guide to the expression of uncertainty in measurement

11.4 References Not Cited in This Standard

11.4.1 AIAG Standards (Automotive Industry Action Group)

AIAG MSA	Measurement System Analysis (MSA)
AIAG SPC-3	Statistical Process Control

11.4.2 ASME Standards (American Society of Mechanical Engineers)

ASME Y14.5	Dimensioning and Tolerancing
ASME Y14.5.1	Mathematical Definition of Dimensioning and Tolerancing Principles

11.4.3 ISO Standards (International Organization for Standardization)

ISO 2859	Sampling procedures for inspection by attributes
ISO 3951	Sampling procedures for inspection by variables
ISO 14253	Geometrical product specifications (GPS) - Inspection by measurement of workpieces and measuring equipment
ISO 9000:2015	Quality management systems/Fundamentals and vocabulary

11.4.4 SAE Standards (SAE International)

SAE J1739	Potential Failure Modes and Effects Analysis

Summary of Changes from Previous Edition
(For Information Only — Not Part of the Standard)

Updated “key characteristic” to “special characteristic” where applicable throughout.

Added clause 2.6.

Added Table 6 (after clause 8.3.6.1).

Updated clause 8.3.6.4.